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Meteorological Satellites (METSAT) and Earth Observing System (EOS) Advanced Microwave Sounding Unit-A (AMSU-A) Reliability Prediction Report

Contract No: NAS 5-32314
CDRL: 110

Submitted to:

National Aeronautics and Space Administration
Goddard Space Flight Center
Greenbelt, Maryland 20771

Submitted by:

Aerojet
1100 West Hollyvale Street
Azusa, California 91702

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Section 1

INTRODUCTION

This report documents the reliability prediction performed on the Meteorological Satellites (METSAT) and the Earth Observing System (EOS) Advanced Microwave Sounding Unit-A AMSU-A instruments.

As described in Section 7, the instrument is partitioned into an Antenna Subsystem (AS), a Receiver Subsystem (RS) and an Electronics Subsystem (ES). The subsystems are partitioned into an A1 module and an A2 module. The Antenna and Receiver Subsystems are common for METSAT and EOS except for a compensation assembly in the Antenna Subsystem A2 Module (A2AS). Reliability block diagrams are provided for the METSAT Electronics Subsystem A1 Module (A1ES-METSAT), and the A2 Module (A2ES-METSAT), the EOS Electronics Subsystem A1 module (A1ES-EOS), and the A2 module (A2ES-EOS). A summary of this indexing is shown in Table I.

Table I Identification of AMSU-A Subsystems/Modules

AMSU Component	Index
METSAT/EOS Common	
A1 Module Antenna Subsystem	A1AS
A2 Module Antenna Subsystem	A2AS
A1 Module Receiver Subsystem	A1RS
A2 Module Receiver Subsystem	A2RS
METSAT Unique	
A1 Module Electronics Subsystem	A1ES-METSAT
A2 Module Electronics Subsystem	A2ES-METSAT
EOS Unique	
A1 Module Electronics Subsystem	A1ES-EOS
A2 Module Electronics Subsystem	A2ES-EOS

1.1 *Prediction Summary*

The predicted reliability, Mission Life and MTBF, of the METSAT and EOS AMSU-A instruments for a three year orbital life at an ambient temperature of +30°C are shown in Table II:

Table II Predicted Mission Life and MTBF

Instrument-Module	Specified (3 years)	Predicted (3 years)	MTBF (hours)
METSAT-A1	N/A	0.7715	101,359
METSAT-A2	N/A	0.9091	275,956
EOS-A1	0.70	0.7711	101,172
EOS-A2	0.84	0.9176	305,646

Mission Life Requirements, of GSFC S-480-13, Performance and Operational Specification for the Advanced Microwave Sounding Unit were used for the EOS "specified" requirements. No mission life requirements were specified for METSAT.

Several circuits are common to both assemblies; the common data are utilized in each prediction without change. (See Appendix A).

1.2 *General*

This report provides the following information:

a. Results of reliability analyses.
b. Conditions for failure rate calculations.
c. Reliability math models.
d. Reliability block diagrams.
e. Functional descriptions of EOS and METSAT AMSU-A instruments.
f. Subsystem functional block diagrams.

The MTBFs and Mission Life predictions were prepared from failure rates identified on the Reliability Block Diagrams provided in Section 5.

Appendix A presents the failure rate calculations for the METSAT/EOS components and parts that support the failure rates shown on the reliability block diagrams.

Section 2

APPLICABLE DOCUMENTS

This report was prepared in compliance with the relevant requirements and guidance contained in the following documents.

GSFC POS	Performance and Operation Specifications for the Earth Observing System/Advanced Microwave Sounding Unit (EOS/AMSU)
GSFC PAR	Performance Assurance Requirements for the Earth Observing System/Advanced Microwave Sounding Unit (EOS/AMSU)
MIL-STD-756	Military Standard, Reliability Modeling and Prediction
MIL-STD-785	Reliability Program for System Modeling and Prediction
MIL-HDBK-217F Notice 1	Military Handbook, Reliability Prediction of Electronic Equipment
NPRD-91	Non-Electronic Parts Reliability Data
MIL-STD-975	NASA Standard Electrical, Electronic, and Electromechanical (EEE) Parts List
AE-26607 Mar 1996	Subsystem Specification AMSU-A Antenna
AE-26608 Mar 1996	Subsystem Specification AMSU-A Receiver
AE-26609 Mar 1996	Subsystem Specification AMSU-A Electronics
1356009	Interconnect Diagram EOS/AMSU-A1
1356007	Interconnect Diagram EOS/AMSU-A2
1356940	Interconnect Diagram METSAT/AMSU-A1
1356945	Interconnect Diagram METSAT/AMSU-A2

Section 3

RELIABILITY ANALYSIS

The reliability prediction described herein was performed in accordance with Task 203 of MIL-STD-785. The failure rates used were derived primarily from MIL-HDBK-217. Other failure rate sources, such as NPRD-91, GIDEP, Vendor data, and Aerojet experience were also used.

Figures 1 and 2 summarize the reliability prediction data for the METSAT and EOS subsystems and A1 and A2 modules, respectively. These predictions were performed by analyzing each component listed in the reliability block diagrams. (See Tables in Appendix A (Section A1) for the A1 Module analysis and Tables in Appendix A (Section A2) for the A2 Module analysis.)

The data in Appendix A are predictions performed in accordance with MIL-HDBK-217 and other sources as applicable. (For example, predictions for vendor supplied parts and parts not listed in MIL-HDBK-217.)

3.1 *Prediction procedure/ground rules*

The prediction uses the guidelines of MIL-HDBK-217 and is based on the following ground rules:

a. The equipment operates in a spacecraft environment.

b. Component parts are properly derated.

c. An ambient temperature of +30°C is selected as the operating temperature.

d. Duty cycled failure rates are not utilized.

e. Part failures will occur randomly and independently from each other.

f. All component parts meet or exceed the reliability requirements specified.

g. Reliability and redundancy are based upon a three-year life, i.e., at the time of launch the instrument is fully operational and is energized when the desired orbit is achieved.

h. Redundancy utilized in this prediction is limited to the redundant PLO circuit, temperature monitor, and the 0.05 percent platinum resistor temperature (PRT) circuits with one allowable failure out of each seven PRT circuits.

i. Mission noncritical items (see 3.2) are not included.

j. The latest version parts lists and Aerojet drawings are used.

k. Failure rates and reliability figures for various purchased items are vendor supplied. Where possible, subcontractor failure rates are used in this prediction. Otherwise, the specification reliability requirement was converted to a failure rate using three (3) years for time.

3.2 *Excluded items*

Components nonessential to mission requirements have not been included in this prediction. The objective of this report is to produce a reliability prediction for the mission essential components that are required to provide uncompromised data from all channels. The items excluded from this prediction include:

a. Ground support equipment, including test connector and interface assembly.

b. Analog telemetry circuits and output connector.

c. Housekeeping circuits (temperature and voltage monitoring), including temperature sensor B boards and a portion of the PRT Multiplexer.

d. Temperature transducers.

It is assumed that a failure of any of these items will not degrade mission essential system requirements.

Section 4

CONCLUSIONS

As shown in paragraph 1.1, the EOS AMSU-A instrument's predicted reliability exceeds the three year mission life requirements. No mission life requirement was specified for METSAT AMSU-A. However, the predicted reliability of the METSAT AMSU-A instrument also exceeds the specified EOS AMSU-A mission life requirements.

The predicted reliability in this report is considerably improved from the last revision. The previous "A" and "B" revisions were based on early design documentation. This "C" revision is based on released documentation and subcontractor CDRL submittals which more accurately depict the EOS and METSAT AMSU-A instruments.

Estimates of the software failure rates are based on the heritage of the K-L-M AMSU-A program. Similarly, the apportioned complexity of the A1 vs the A2 modules has been applied to software failure rate estimates using Aerojet Engineering experience.

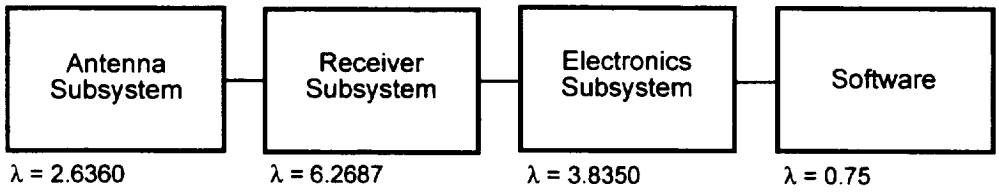
Section 5

RELIABILITY BLOCK DIAGRAMS

The reliability block diagrams were prepared from design descriptions in the subsystem specifications for the Antenna Subsystem (AE-26607), Receiver Subsystem (AE-26608) and Electronics Subsystem (AE-26609), and from functional parts (CCA's and other hardware) shown in the interconnect diagrams for the EOS A1 Module (1356009), EOS A2 Module (1356007), METSAT A1 Module (1356940) and the METSAT A2 Module (1356945).

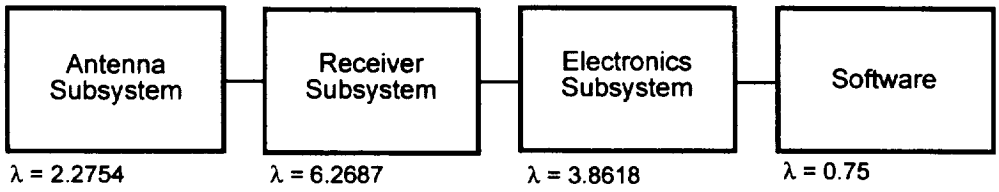
The Antenna Subsystem block diagrams are the same for both METSAT and EOS except for a compensation assembly in the METSAT A2 Module. The Receiver Subsystem block diagrams are the same for both METSAT and EOS. The Electronics Subsystem block diagrams and different for METSAT compared to EOS. The block diagrams for EOS and METSAT are provided in the following figures and are identified as described in Section 1, herein.

METSAT Top View Reliability Block Diagram



METSAT λ = 13.4897

EOS Top View Reliability Block Diagram



EOS λ = 13.1559

396-3025M

Figure 1 Top View, AMSU-A Subsystems, Reliability Block Diagram

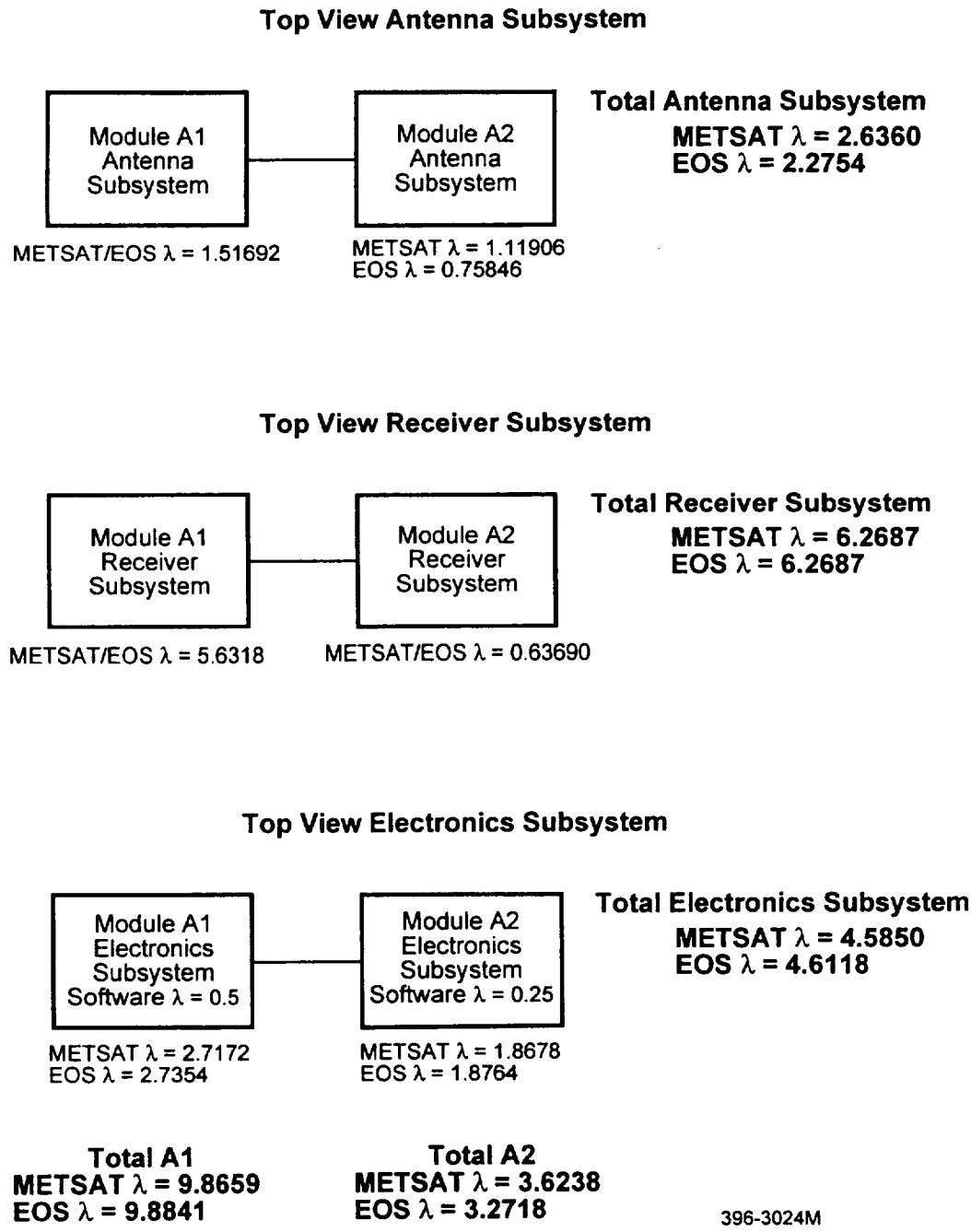


Figure 2 Top View, AMSU-A Module A1 and A2 Reliability Block Diagram

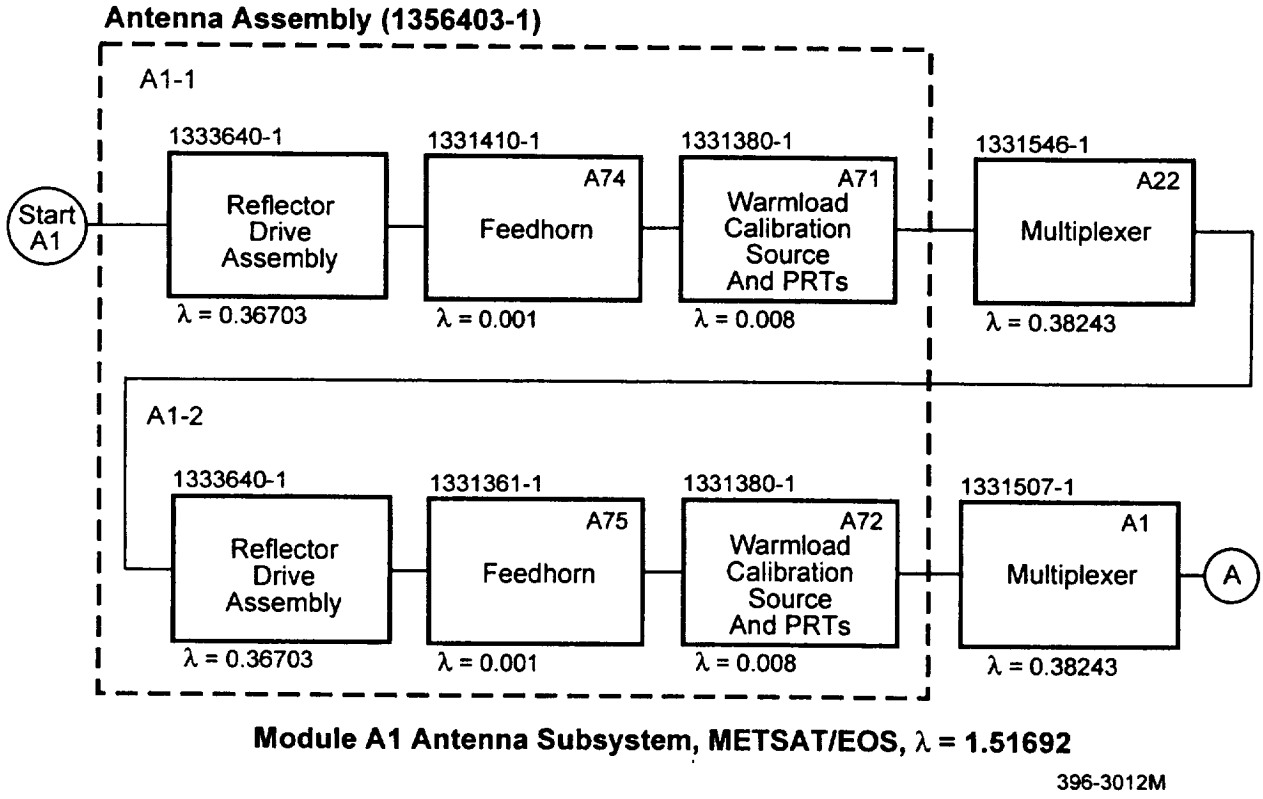


Figure 3 Module A1, Antenna Subsystem, METSAT/EOS Reliability Block Diagram

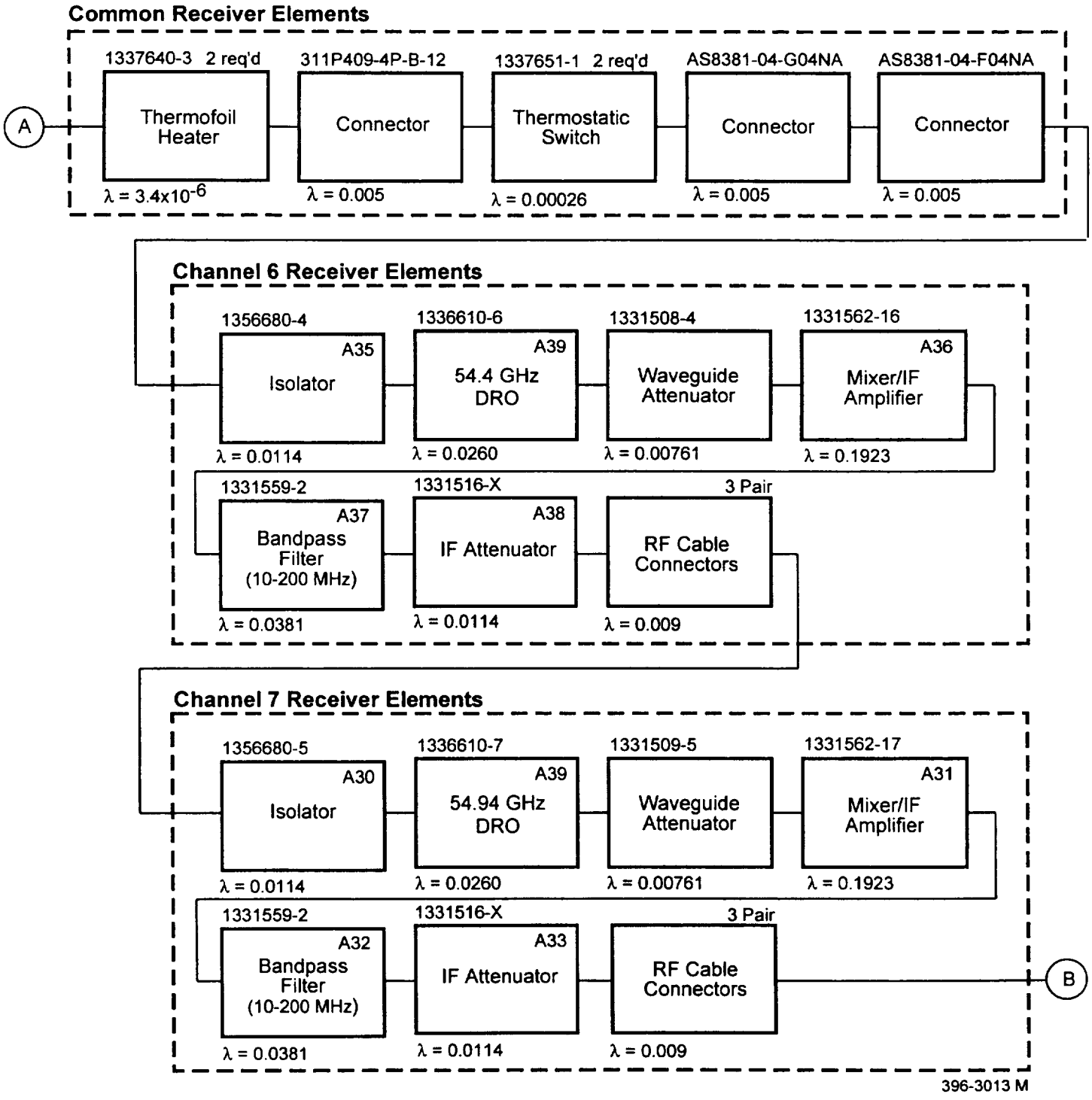


Figure 4 Module A1, Receiver Subsystem, METSAT/EOS Reliability Block Diagram

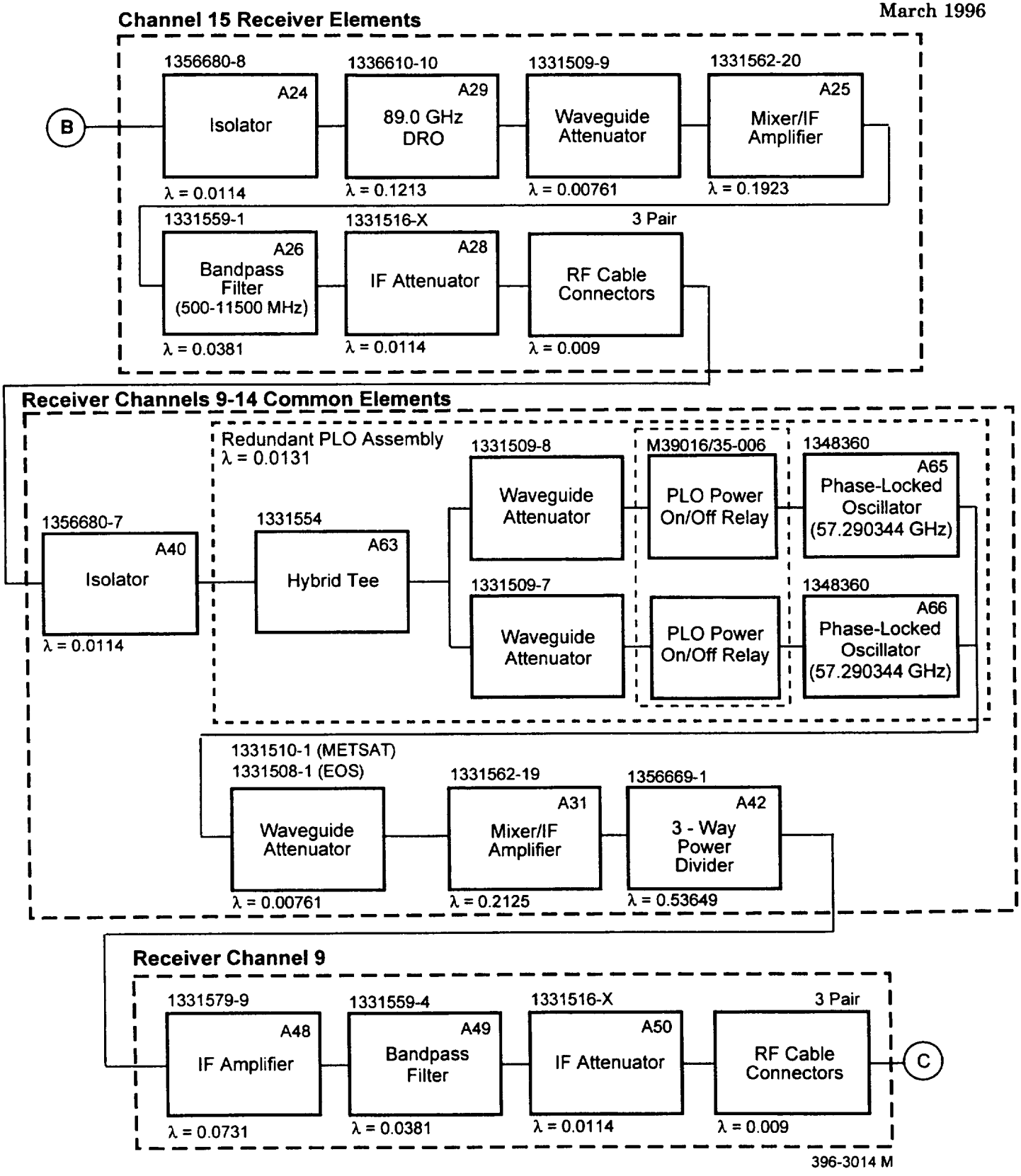


Figure 4 Module A1, Receiver Subsystem, METSAT/EOS Reliability Block Diagram (Continued)

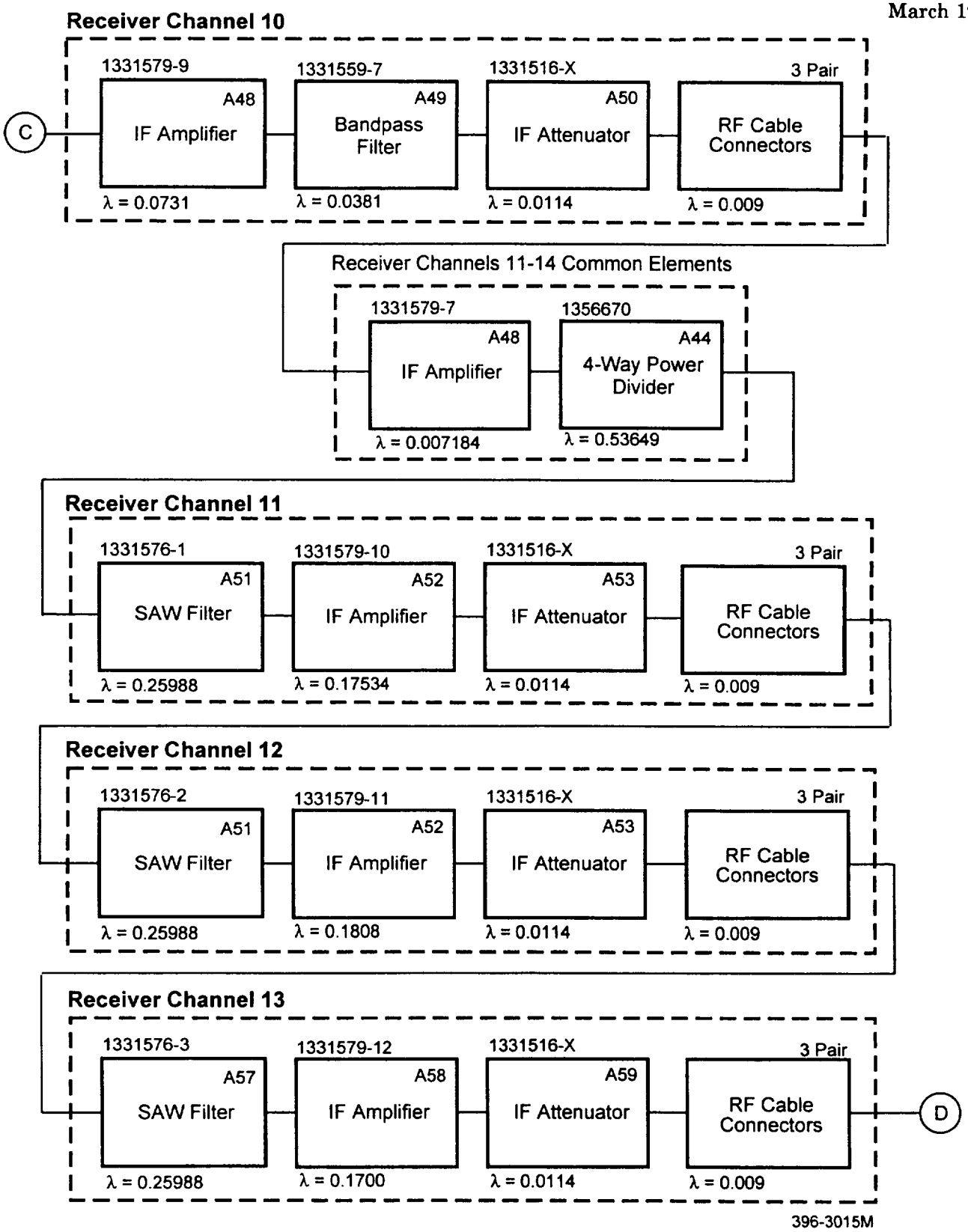


Figure 4 Module A1, Receiver Subsystem, METSAT/EOS Reliability Block Diagram (Continued)

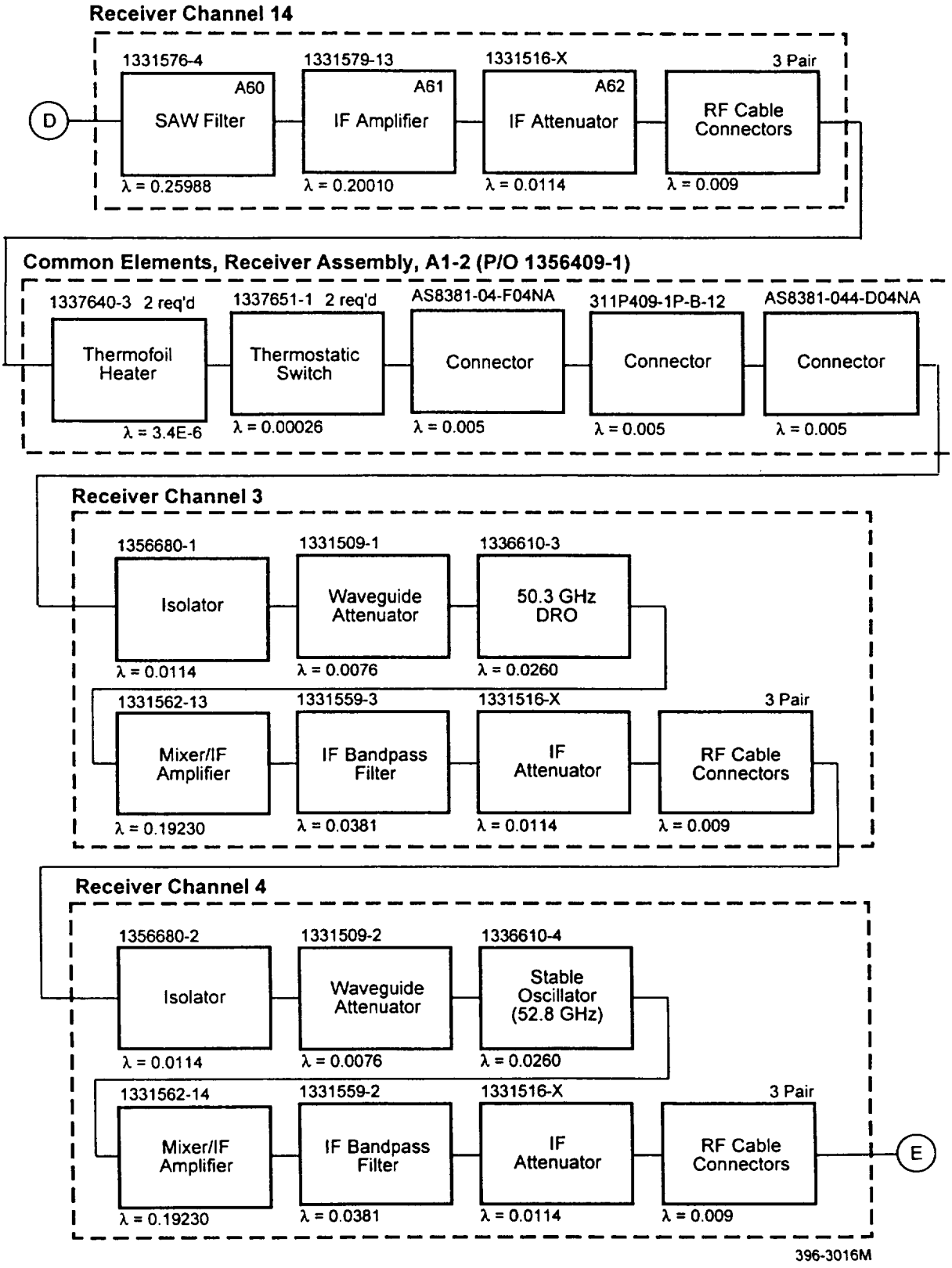


Figure 4 Module A1, Receiver Subsystem, METSAT/EOS Reliability Block Diagram (Continued)

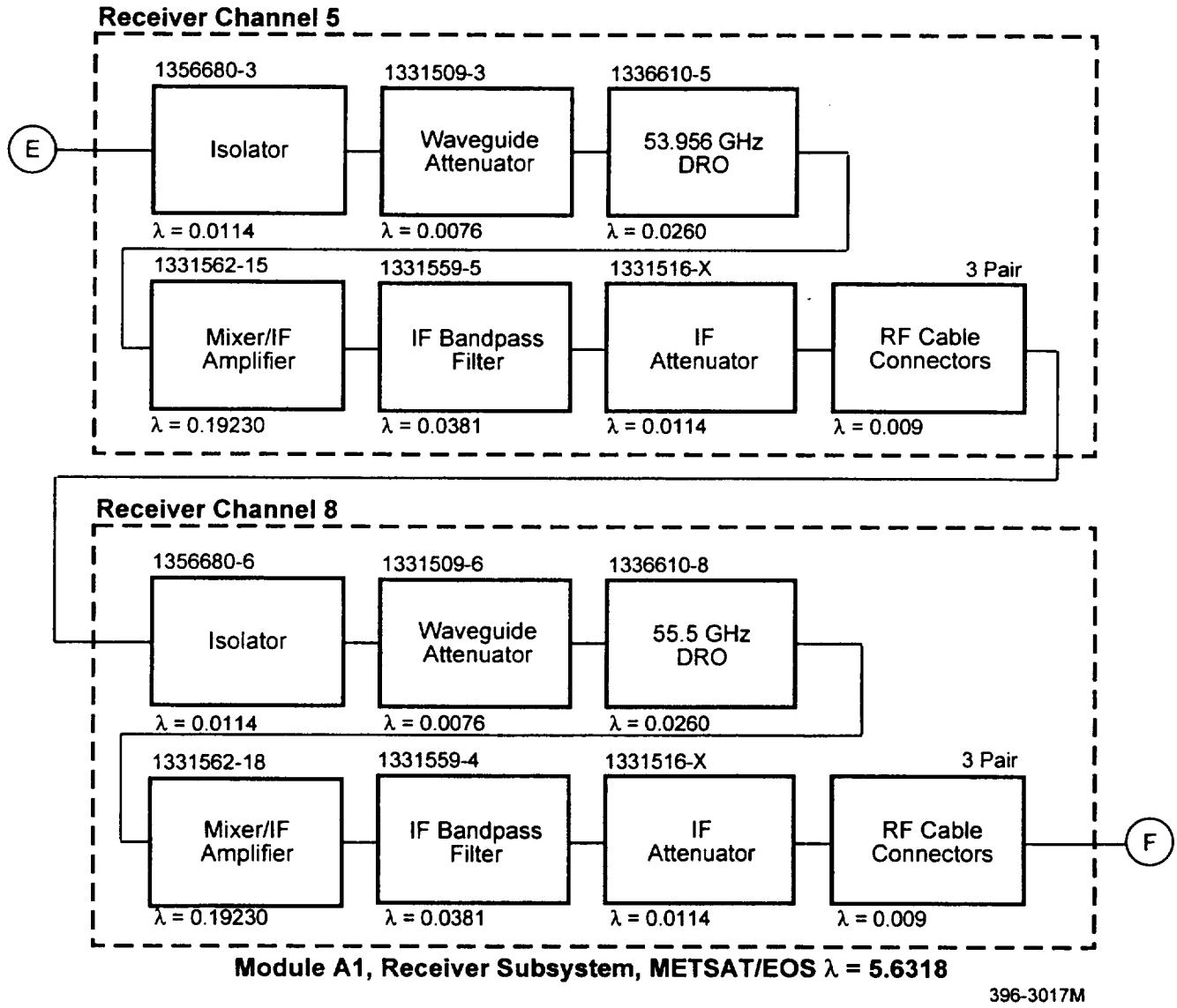


Figure 4 Module A1, Receiver Subsystem, METSAT/EOS Reliability Block Diagram (Continued)

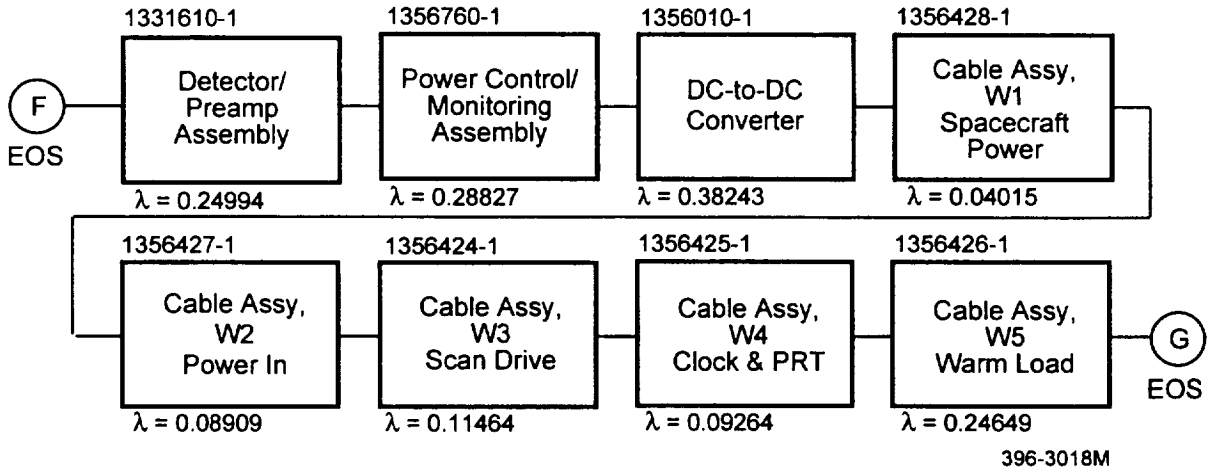


Figure 5 Module A1, Electronics Subsystem, EOS Reliability Block Diagram

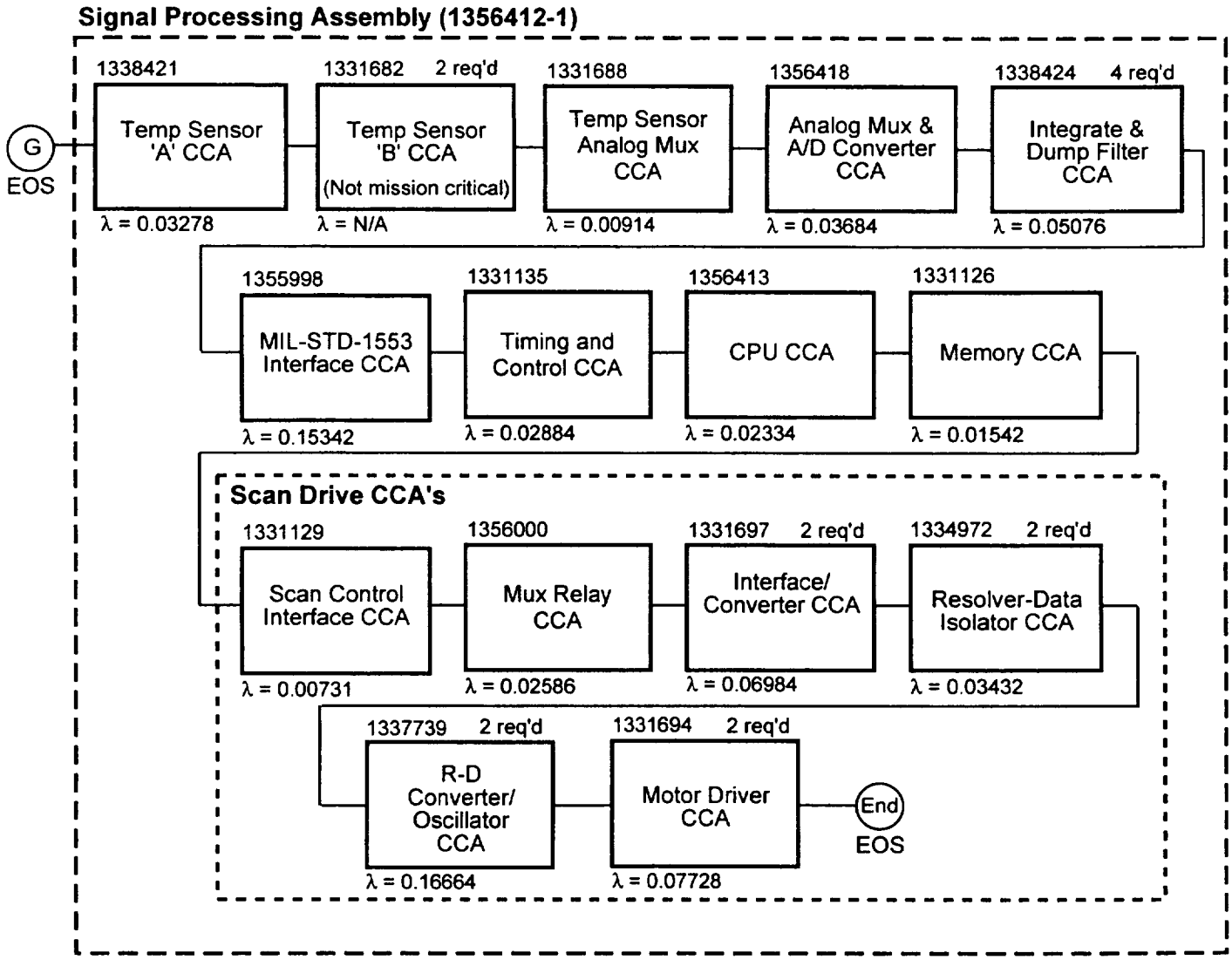


Figure 5 Module A1, Electronics Subsystem, EOS Reliability Block Diagram (Continued)

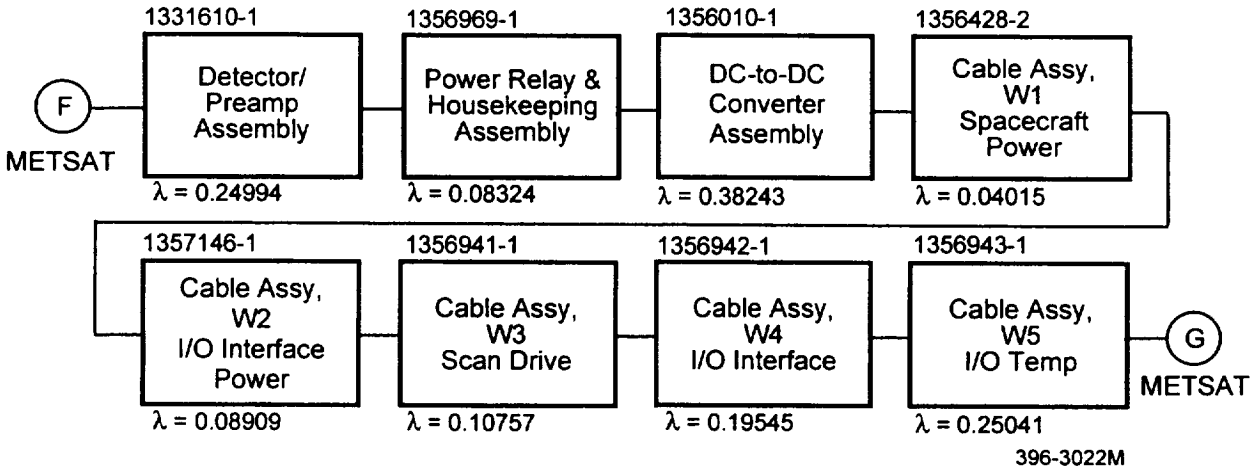
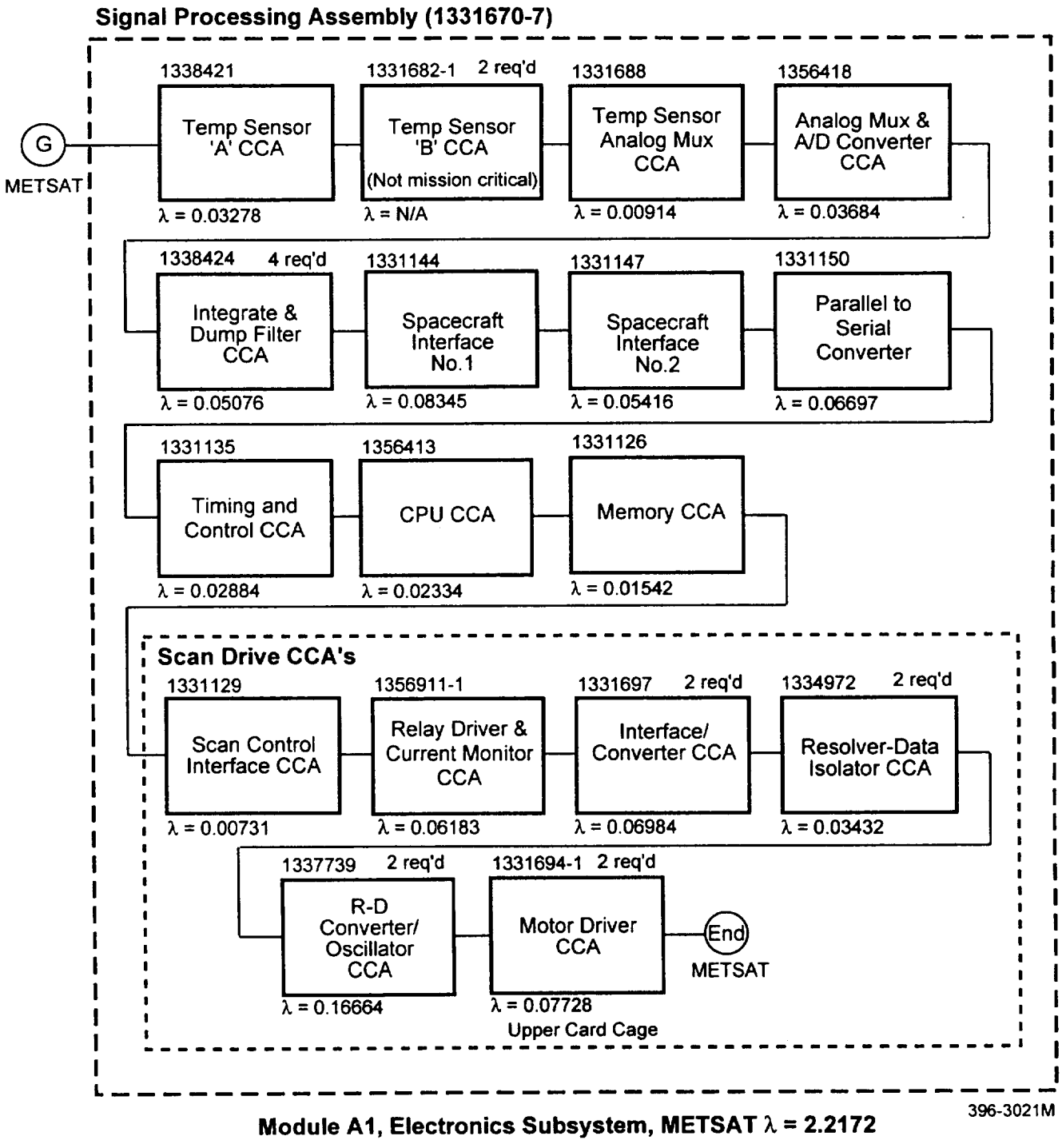


Figure 6 Module A1, Electronics Subsystem, METSAT Reliability Block Diagram



Module A1, Electronics Subsystem, METSAT λ = 2.2172

Figure 6 Module A1, Electronics Subsystem, METSAT Reliability Block Diagram (Continued)

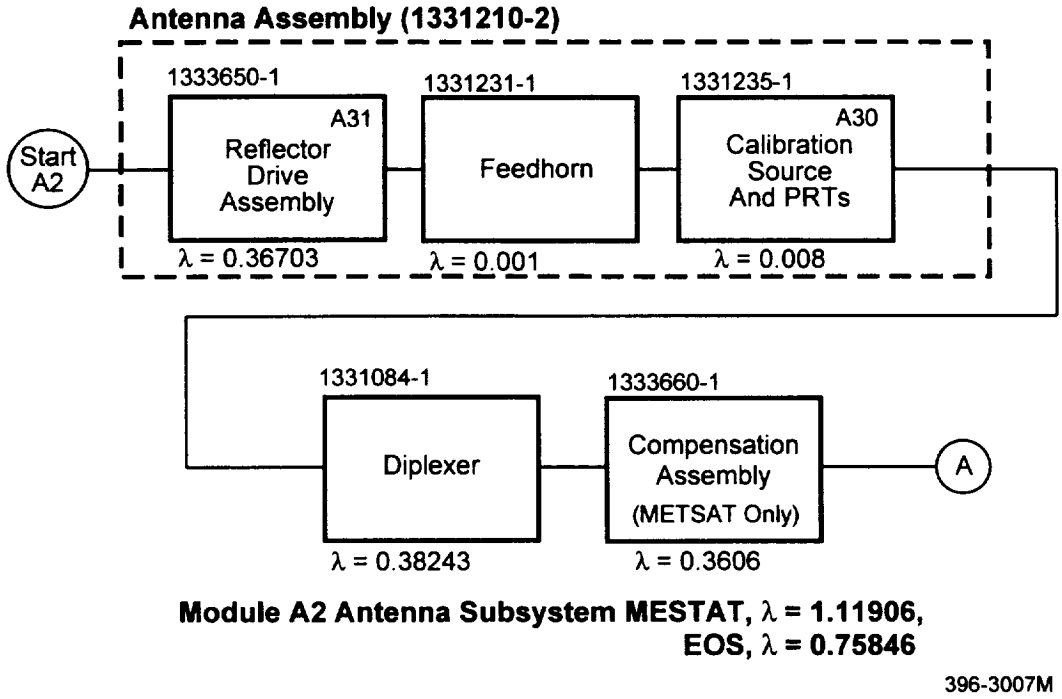


Figure 7 Module A2, Antenna Subsystem, METSAT/EOS Reliability Block Diagram

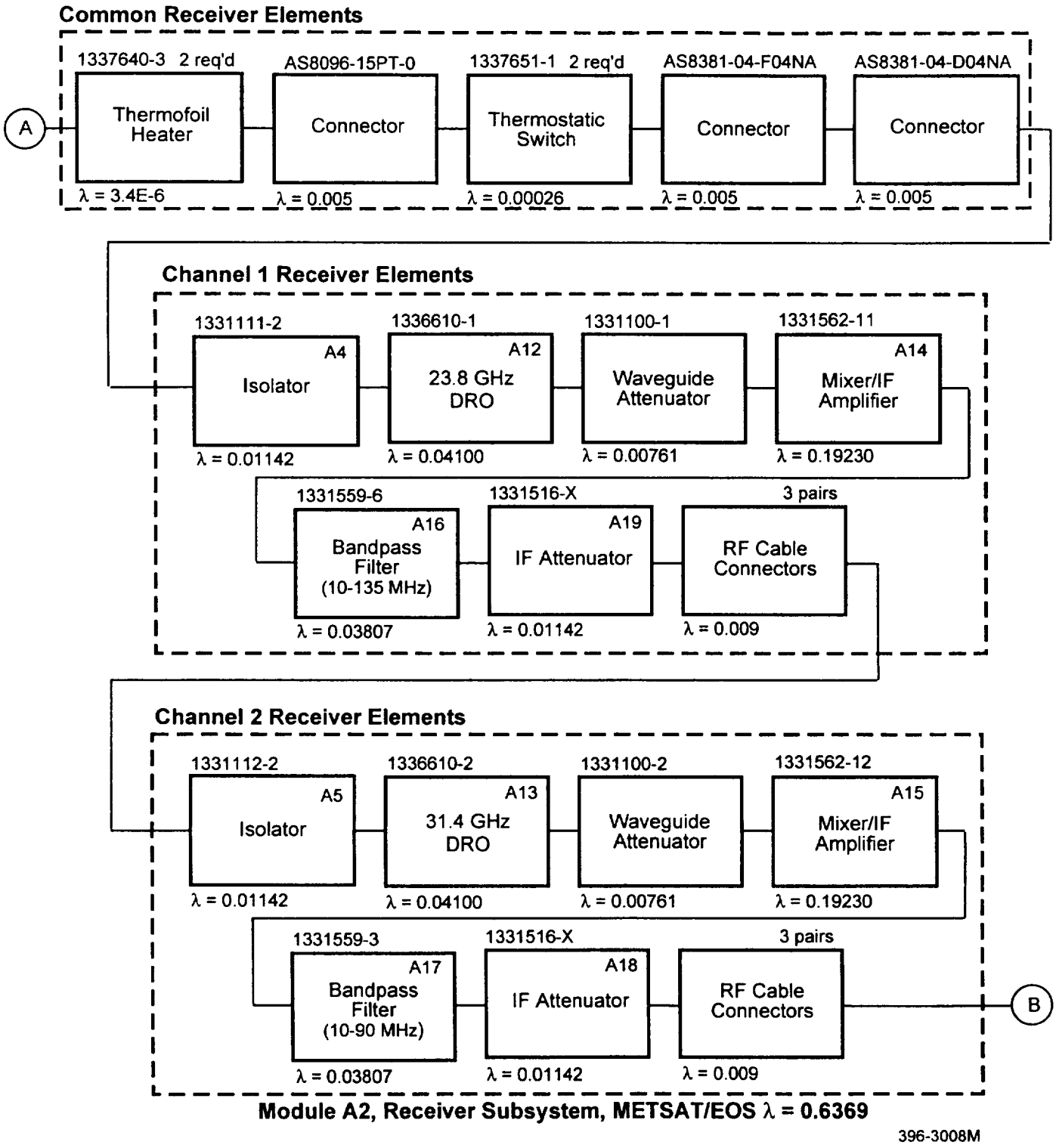


Figure 8 Module A2, Receiver Subsystem, METSAT/EOS Reliability Block Diagram

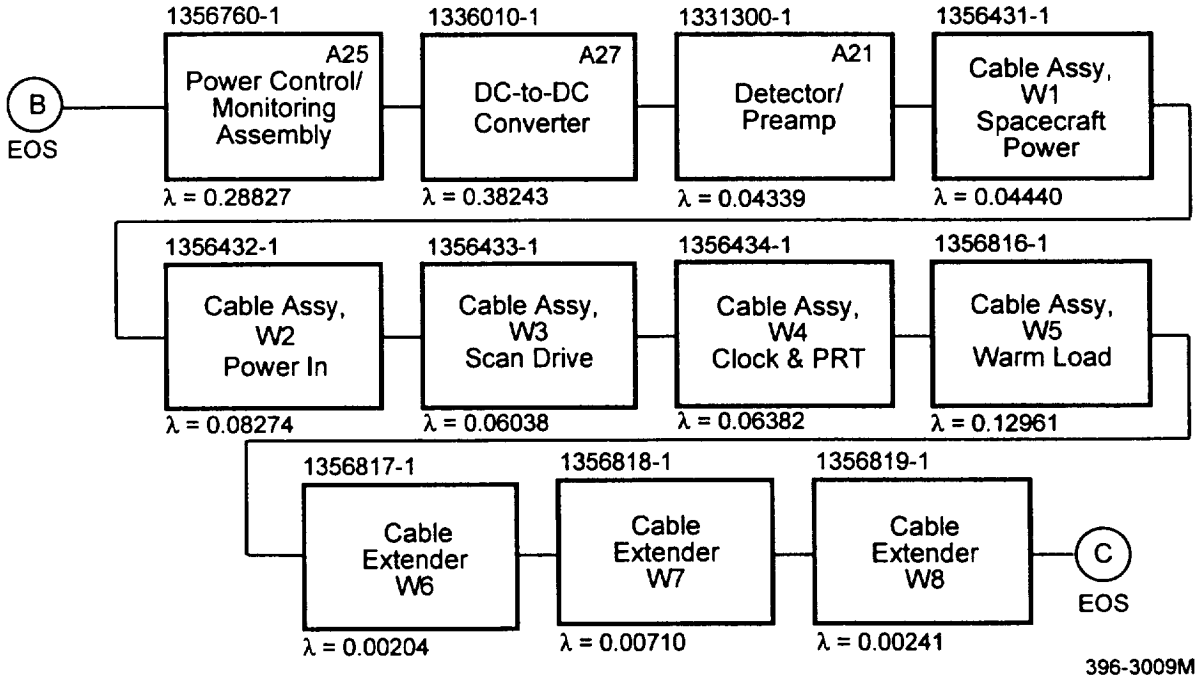


Figure 9 Module A2, Electronics Subsystem, EOS Reliability Block Diagram

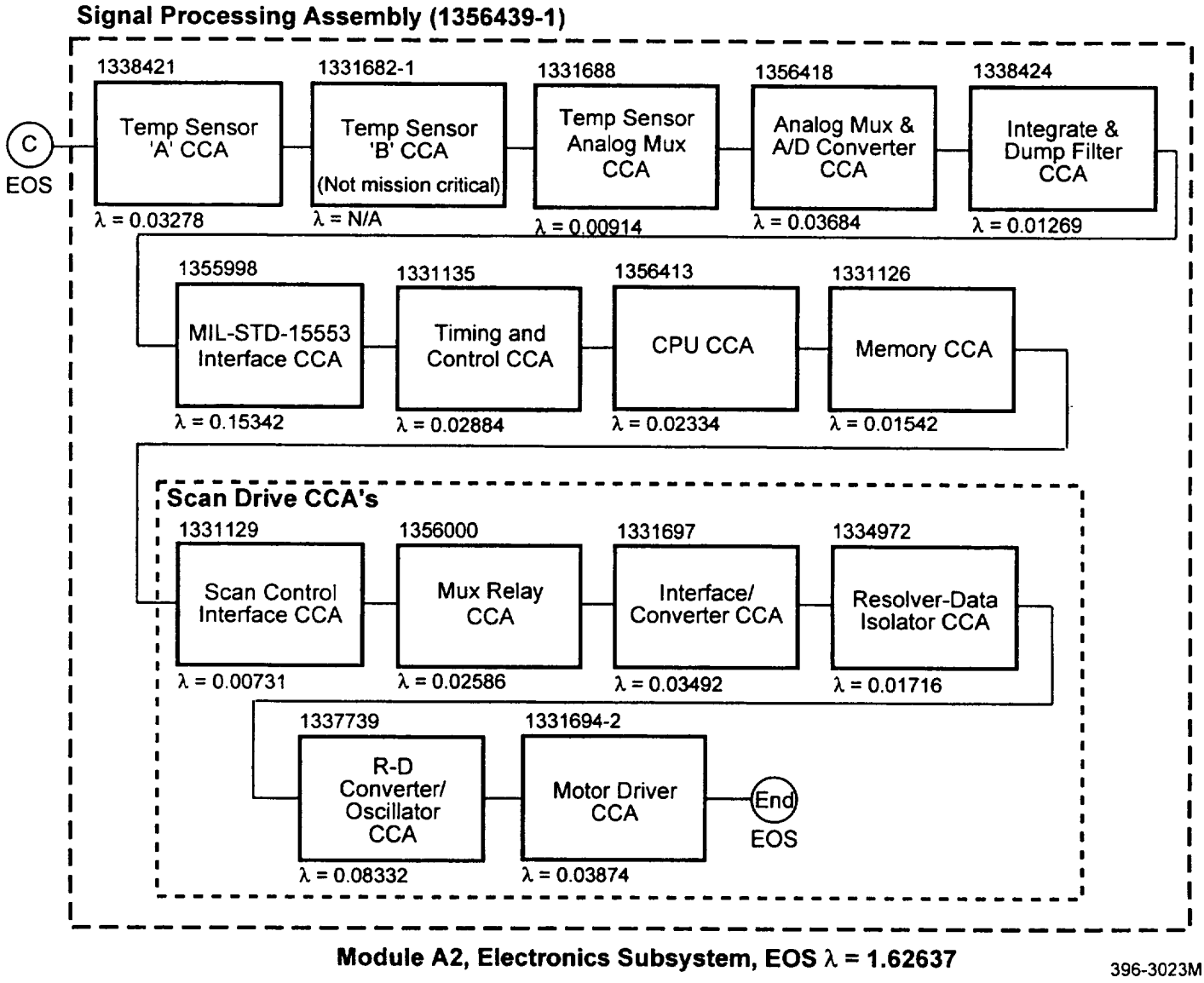


Figure 9 Module A2, Electronics Subsystem, EOS Reliability Block Diagram (Continued)

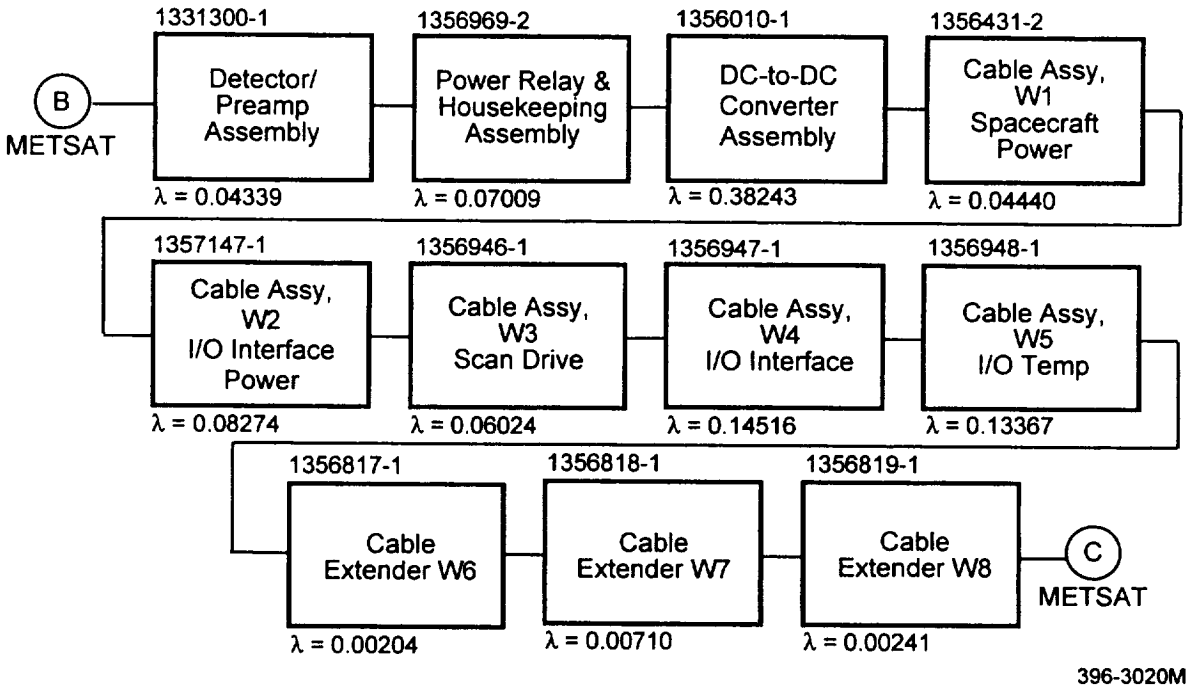


Figure 10 Module A2, Electronics Subsystem, METSAT Reliability Block Diagram

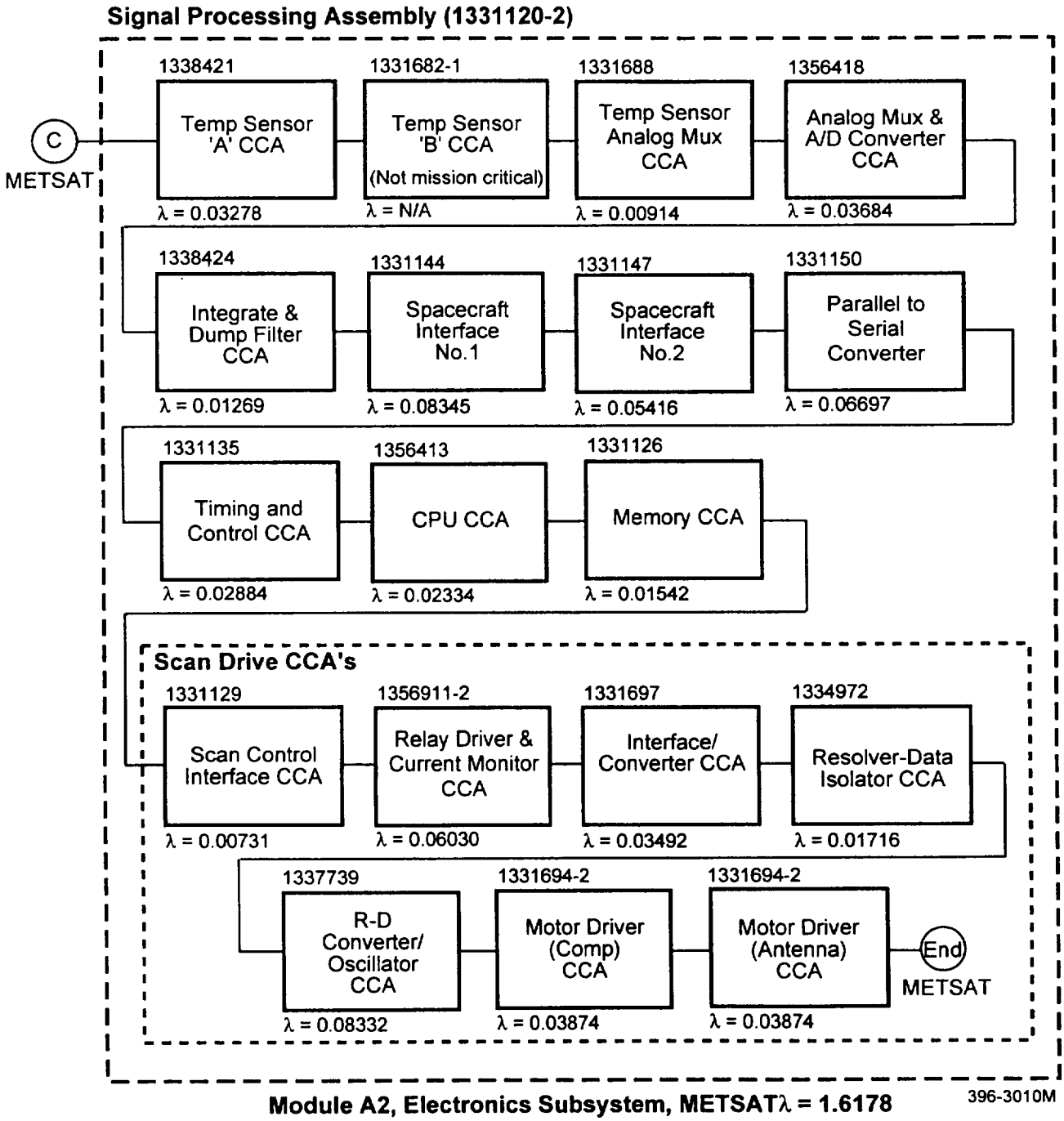


Figure 10 Module A2, Electronics Subsystem, METSAT Reliability Block Diagram (Continued)

Section 6

IMPROVEMENTS

Table III provides METSAT changes from K-L-M. Differences between EOS and METSAT instruments are discussed in Section 7, herein.

Table III AMSU-A METSAT Changes From K-L-M

Item	Change	Reason for Change
A1 Upper Card Rack	Changed from 4 CCA to 2 CCA (2 motor driven CCA).	Power Control Logic and Analog Housekeeping CCA combined for improved reliability
A1 Lower Card Rack	New Relay Driver CCA added, requiring shifting of other cards one slot.	Repositioning of cards to minimize risk of crosstalk and maximize interconnect efficiency.
A2 Card Rack	2 CCA deleted, 1 CCA added, 7 CCA shifted 2 slots in card rack.	Repositioning of cards to minimize risk of crosstalk and maximize interconnect efficiency.
Motor Drive Transistors	Were bulkhead mounted and hard-wired, now are integral part of cable assembly as transistor/diode assembly	Wired as part of cable assembly to eliminate wiring at system level, combined with transient suppression diodes on assembly for best performance.
DC-DC converter	New design	Power requirements changed because of change from GDO to DRO in receiver and new supplier.
System Interconnect	New connectorized harness	Reduce system noise and reduce integration and test time.
CPU CCA	Different RAM used and additional clock buffering added.	A. RAM discontinued B. Buffer drive margin added
Analog MUX and A/D CCA	Part of radiation latchup removal redesigned.	Dual PNP transistor no longer available.
Motor Driver CCA	Current and gain limiter resistors moved to power relay assembly. Diodes moved to Transistor/Diode assembly.	Removes motor drive current from A2 card cage to minimize system noise, A1 modified for commonality.
Power Control Relay and Analog Housekeeping CCA	No longer used.	High current functions in A1 upper card cage moved to new Power Relay Assembly and to new Relay Driver CCA.
28V Switching Assembly and Power Distribution Terminal Boards	No longer used.	Functions now contained in new Power Relay Assembly.
PLO Relay	Moved from deleted Power Control Logic CCA to Receiver shelf.	CCA deleted

The METSAT/EOS AMSU-A instruments have one redundant circuit. This circuit provides redundant 57.29034GHz PLOs for channels 9-14 (see Figure 4). Only one PLO is active during operation and switching is provided by a latching relay having two coils, one for each position of the contacts. One contact position selects the primary PLO, the other position selects the redundant PLO.

Section 7

FUNCTIONAL DESCRIPTION OF METSAT/EOS AMSU-A INSTRUMENTS

The AMSU-A instrument is a multichannel radiometer that will be used for measuring global atmospheric temperature profiles.

The AMSU-A instrument is a line-scan microwave sensor designed to measure scene radiance in 15 channels to permit the calculation of the vertical temperature profile from the surface of the Earth to approximately the 3 millibar pressure height.

The ability of passive microwave sensors to operate in the presence of clouds is the essence of their effectiveness and has led to their development for this AMSU-A instrument.

7.1 *AMSU-A1 and AMSU-A2 Modules*

The AMSU-A instrument is implemented in two separate modules, AMSU-A1 and AMSU-A2. The two lowest frequencies (Channels 1 and 2) are placed into the AMSU-A2. The antenna for AMSU-A2 is much larger, about 12 inches in width; whereas AMSU-A1 uses two smaller antennas, each about 5 inches in width, for Channels 3 through 15.

The basic operation of these two modules is very similar. They use the same approach and techniques to perform their function. Each of these two modules shares many of the same subassemblies, circuit card assemblies, and other items.

Each module is configured in the same fashion, and consists of three major subsystems: (a) antenna subsystem, (b) receiver subsystem, and (c) electronics subsystem. In each module, the basic design of each subsystem is the same, differing only as a result of the specific frequencies.

In the 13-channel module, identified as AMSU-A1, two separate and independent antenna, receiver, and electronic subsystems are integrated into a single common mechanical/structural and thermal subassembly.

7.1.1 *Receiver Subsystem*

7.1.1.1 *Subsystem Description*

The AMSU-A1 Receiver Subsystem is composed of the functional receiver elements and the structural members, called the receiver shelves, required to support the receiver elements and interface to the AMSU-A instrument structure.

The AMSU A1 and AMSU-A2 Receiver Subassemblies are shown in block diagram form in Figures 11 and 12 respectively. The Receiver Subsystem processes fifteen microwave channels. These channels are distributed amongst the receiver shelves as follows:

A1-1 Receiver Shelf	Channels 6, 7, and 9 through 15
A1-2 Receiver Shelf	Channels 3, 4, 5, and 8
A2 Receiver Shelf	Channels 1 and 2

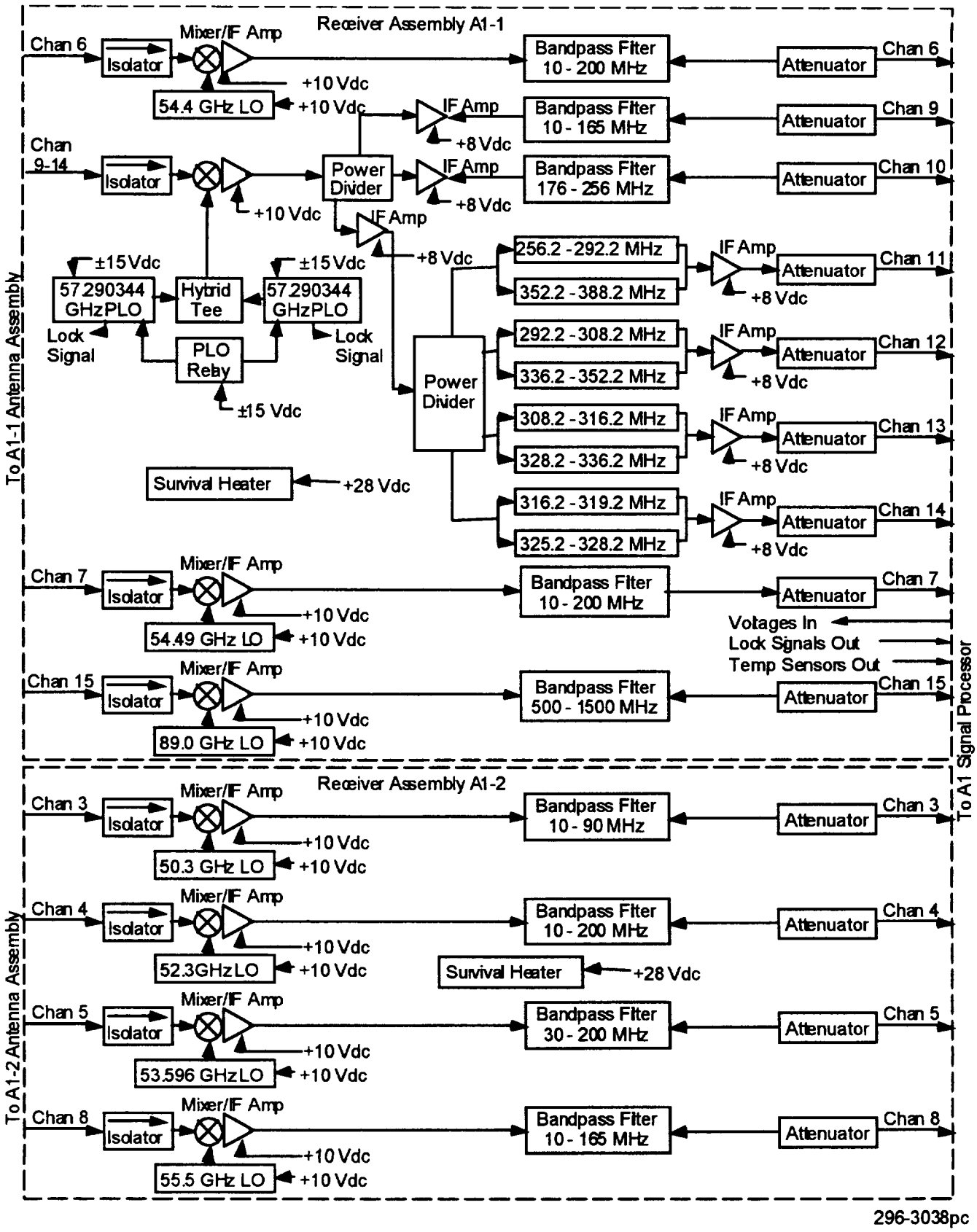


Figure 11 AMSU-A1 Receiver Functional Block Diagram

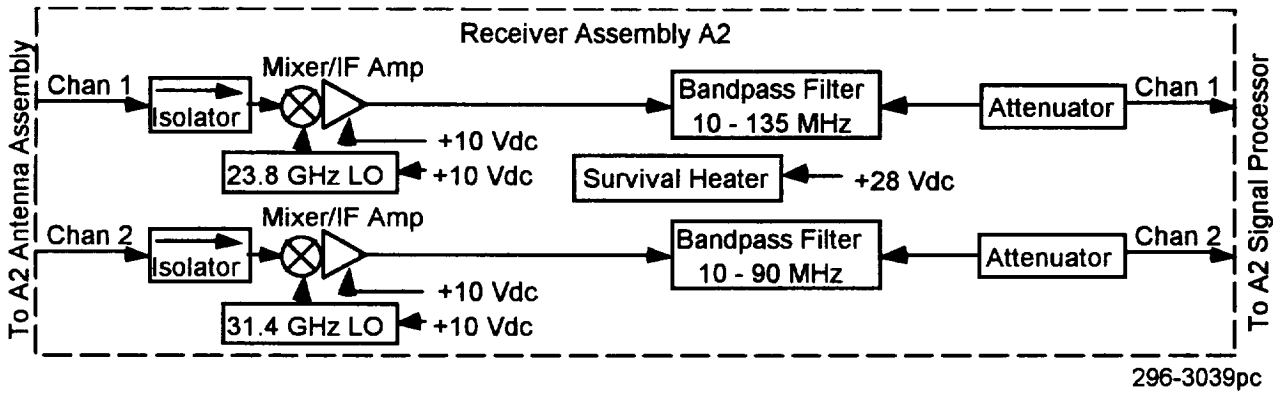


Figure 12 AMSU A2 Receiver Functional Block Diagram

7.1.1.2 *Subsystem Interface Definition*

The Receiver Subsystem functional interfaces are as follows:

Inputs

Microwave signal inputs from the Antenna Subsystem connect directly to the antenna multiplexer output ports via waveguide flange connections.

Voltage inputs from the Power Distribution Assembly of the Electronics Subsystem connect via electrical connectors on each receiver shelf.

Outputs

IF attenuator signal outputs from each channel connect via semirigid coaxial connectors to the Signal Processing Assembly of the Electronics Subsystem.

Temperature sensors and diagnostic sensors connect via electrical connectors on each receiver shelf to the Signal Processing Assembly of the Electronics Subsystem.

7.1.2 *Electronics Subsystem*

7.1.2.1 *Subsystem Description*

The Electronics Subsystem is composed of the electronic elements necessary to provide power, control, commands, data handling, and the electrical interface with the

METSAT and EOS spacecraft for the AMSU-A instrument.

The AMSU-A1 and AMSU-A2 Electronic Subassemblies are shown in block diagram form in Figures 11 through 14. Figures 11 and 12 show the METSAT and EOS AMSU-A1 Electronics Subassemblies respectively. Figures 13 and 14 show the METSAT and EOS AMSU-A2 Electronics Subassemblies, respectively.

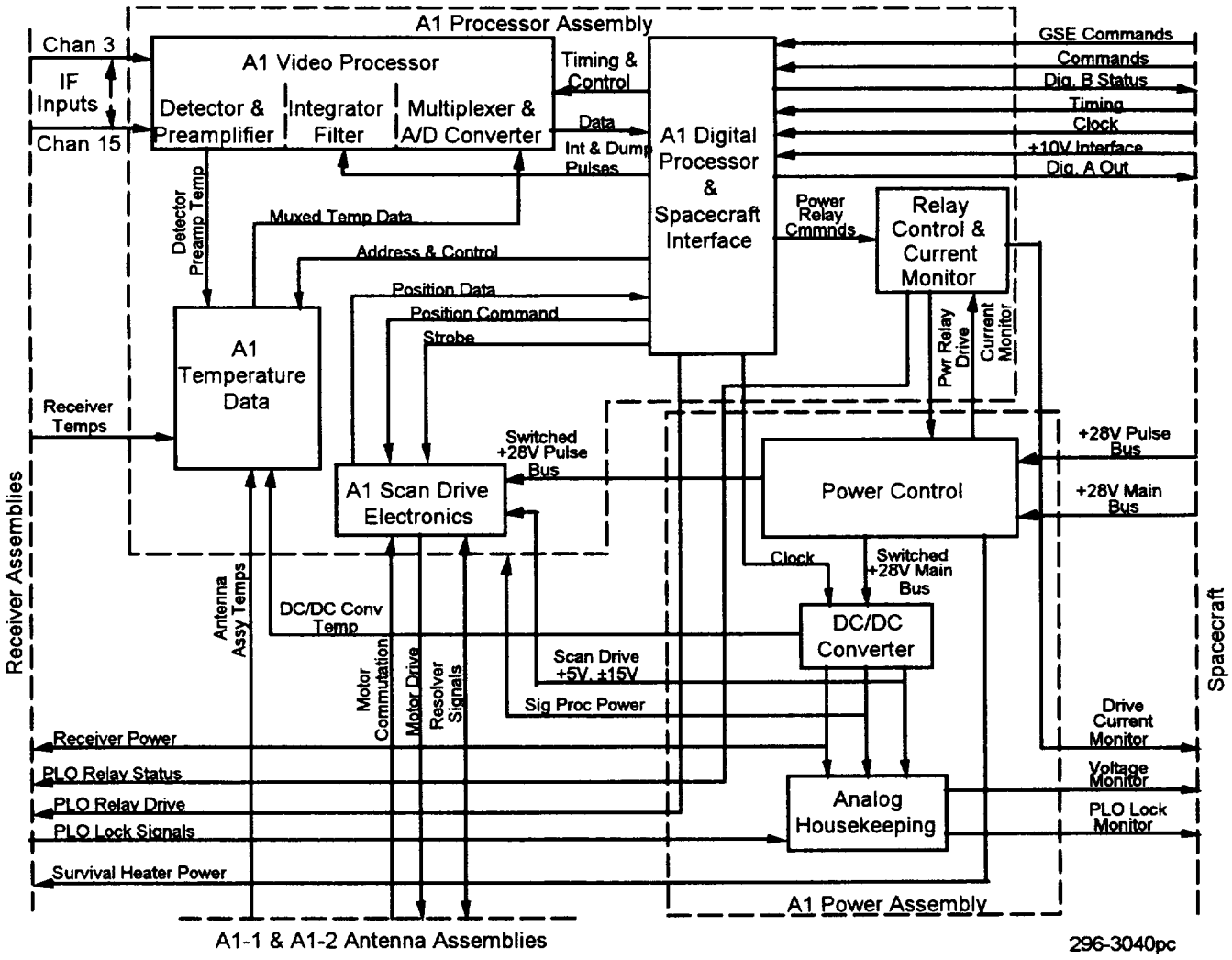


Figure 13 METSAT AMSU A1 Electronics Subassembly

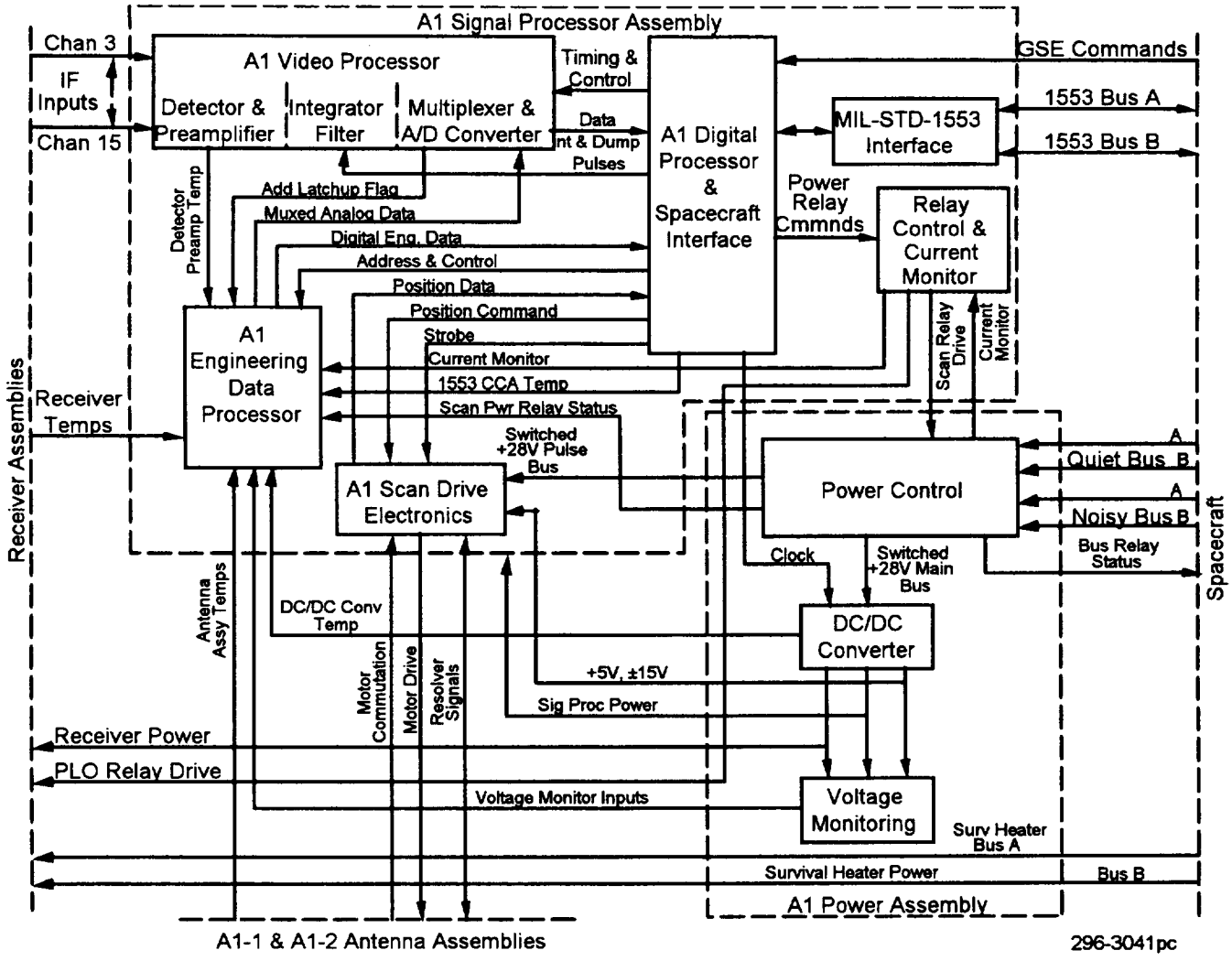


Figure 14 EOS AMSU-A1 Electronics Subassembly

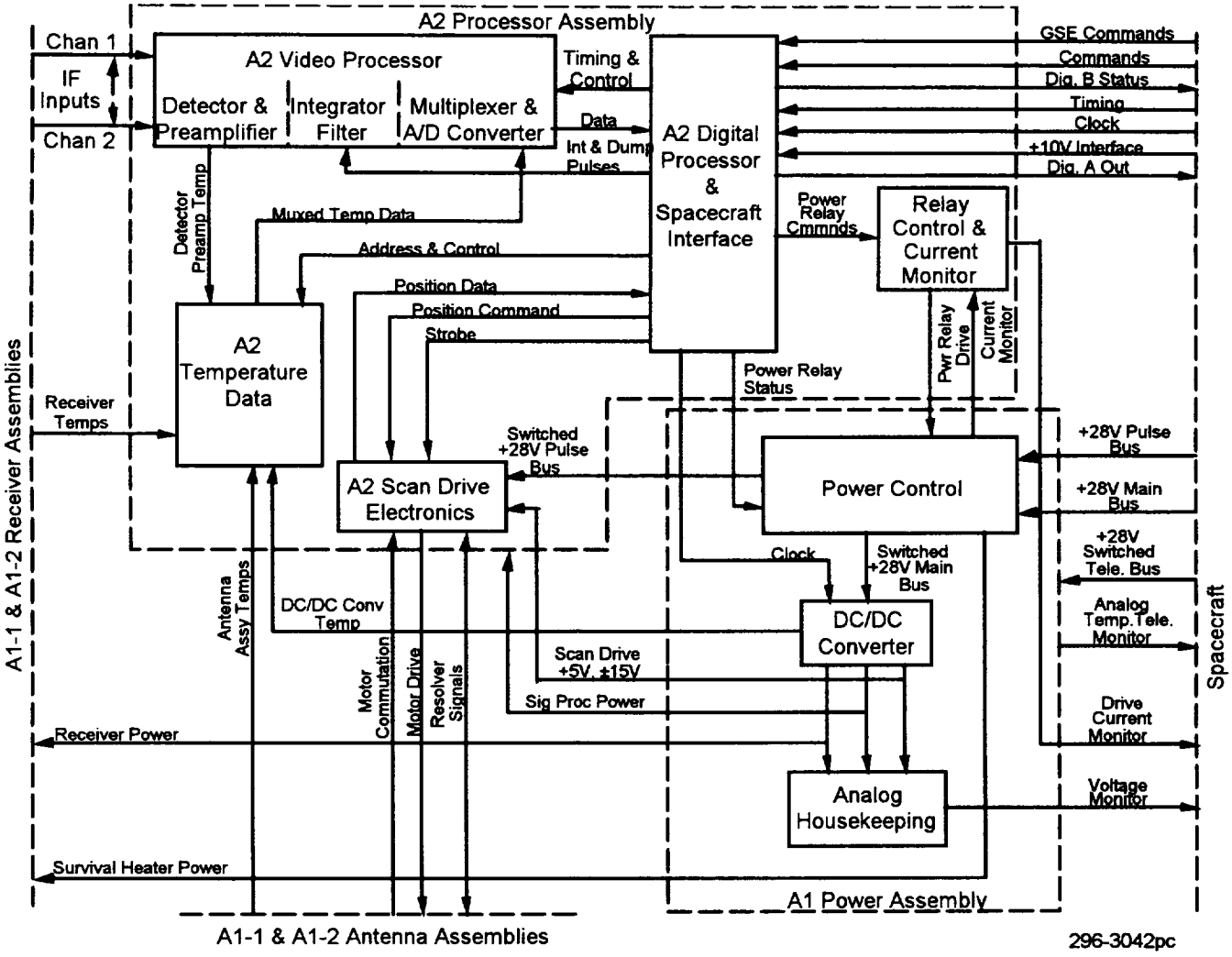


Figure 15 METSAT AMSU-A2 Electronics Subassembly

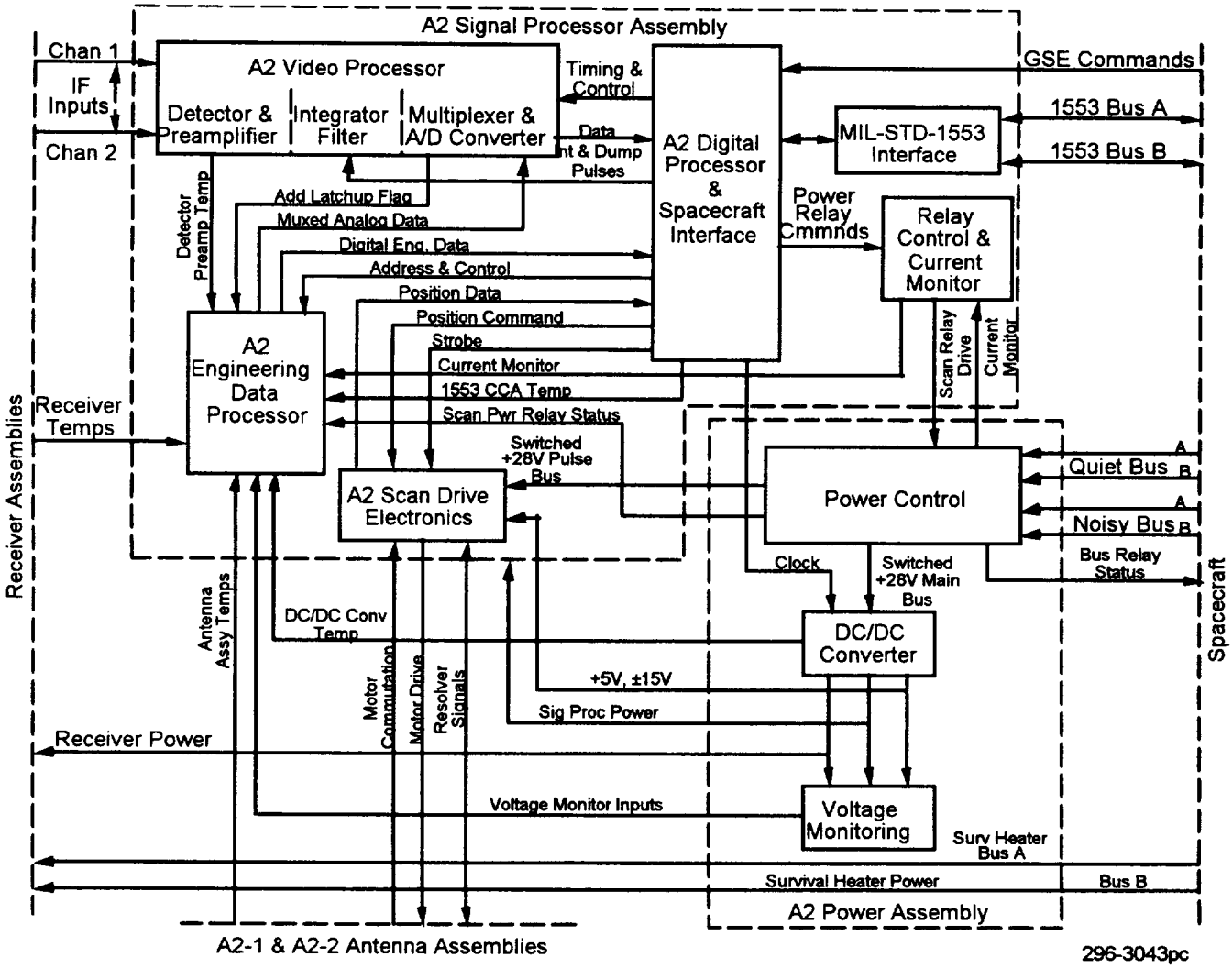


Figure 16 EOS AMSU-A2 Electronics Subassembly

The Signal Processing Assemblies provide video processing of input intermediate frequency (IF) signals, digital processing of the resulting data stream, general control and synchronization of instrument activities, passive analog telemetry circuits and output, scan drive electronics to control antenna position and scan, and data interface control with the METSAT/EOS spacecraft. Each video processor shall provide IF detection, linear preamplification, integration, multiplexing, and digitizing of input signals. The A1 Signal Processing Assembly processes outputs from channels 3 through 15 of the A1 Receiver Subsystem while the A2 Signal Processing Assembly processes outputs channels 1 and 2 of the A2 Receiver Subsystem. Each digital processor provides processor outputs from channels 1 and 2 of the A2 Receiver Subsystem. Each digital processor provides overall control of module operation, receiving commands from the spacecraft and formatting and sending data and status signals, generating timing signals, and providing timing and control signals to and receiving position data from the scan drive electronics. The scan drive electronics converts digital scan control signals to analog motor drive voltages and digitizes antenna resolver output data. Analog circuitry is provided to allow temperature, current, and voltage monitoring of critical instrument elements.

The Power Distribution Assemblies provide distribution and switching of primary spacecraft power to the module subsystems and DC/DC converters in various required operational modes, and a power return and grounding scheme in accordance with METSAT/EOS AMSU-A requirements. The Power Distribution Assemblies also provide distribution and return of the secondary power outputs generated by the DC/DC converters.

7.1.2.2 *Subsystem Interface Definition*

The Electronics Subsystem functional interface is as follows:

Inputs from Receiver Subsystem

IF attenuator signal outputs from each receiver channel connect via semirigid coaxial connectors to the video processing electronics of the Signal Processing Assemblies.

Temperature sensors and diagnostic sensors connect via electrical connectors from each receiver shelf to the Signal Processing Assemblies.

Inputs from Antenna Subsystem

Motor commutation signals from the hall effect sensors mounted on each motor assembly connect via electrical connectors from each Antenna Subassembly to the scan drive electronics of the Signal Processing Assemblies.

Resolver analog position signals connect via electrical connectors from each Antenna Subassembly to the scan drive electronics of the Signal Processing Assemblies.

Temperature sensors connect via electrical connectors from critical antenna components to the temperature conditioning electronics of the Signal Processing Assemblies.

Outputs to Receiver Subsystem

Voltages from the Power Distribution Assembly of the Electronics Subsystem connect via electrical connectors to power each receiver shelf.

PLO relay drive signal from the Relay Control and Current Monitor electronics connect via electrical connector to the Receiver Subsystem.

Survival Heater power passes from the spacecraft to the survival heaters located on each receiver shelf. The Electronics Subsystem has no control over the Survival Heater Bus.

Outputs to Antenna Subsystem

Motor drive signals from the scan drive electronics connect via electrical connectors to move each motor in the Antenna Subsystem.

Resolver drive signals from the scan drive electronics connect via electrical connectors to each resolver in the Antenna Subsystem.

7.1.3 *Antenna Subsystem*

7.1.3.1 *Antenna Subsystem Description*

The AMSU-A Antenna Subsystem is composed of the functional antenna elements, the antenna scan drive motors, the antenna position resolvers, the warm load calibration sources, momentum compensator (METSAT A2 only), and the machined structural housings required to support and align the antenna elements and to mount other elements of AMSU-A.

The A1 and A2 Antenna Subassemblies are shown in block diagram form in Figures 17 and 18 respectively.

7.1.3.2 *Subsystem Interface Description*

The Antenna Subsystem functional interface is as follows:

Inputs

Each reflector collects and focuses microwave radiation into its corresponding feedhorn.

Motor drive signals from the Signal Processing Assembly of the Electronics Subsystem connects via electrical connector on each antenna subassembly.

Resolver drive signals from the Signal Processing Assembly of the Electronics Subsystem connect via electrical connector on each antenna subassembly.

Outputs

Microwave output signals are provided from the multiplexers (or diplexer) to the corresponding Receiver subsystem channel via waveguide connection.

Motor hall effect sensors connect via electrical connectors to the Signal Processing Assembly of the Electronics Subsystem.

Resolver position analog signals connect via electrical connectors to the Signal Processing Assembly of the Electronics Subsystem.

Temperature sensors in the warm calibration load and on other components connect via electrical connectors to the Signal Processing Assembly of the Electronics Subsystem.

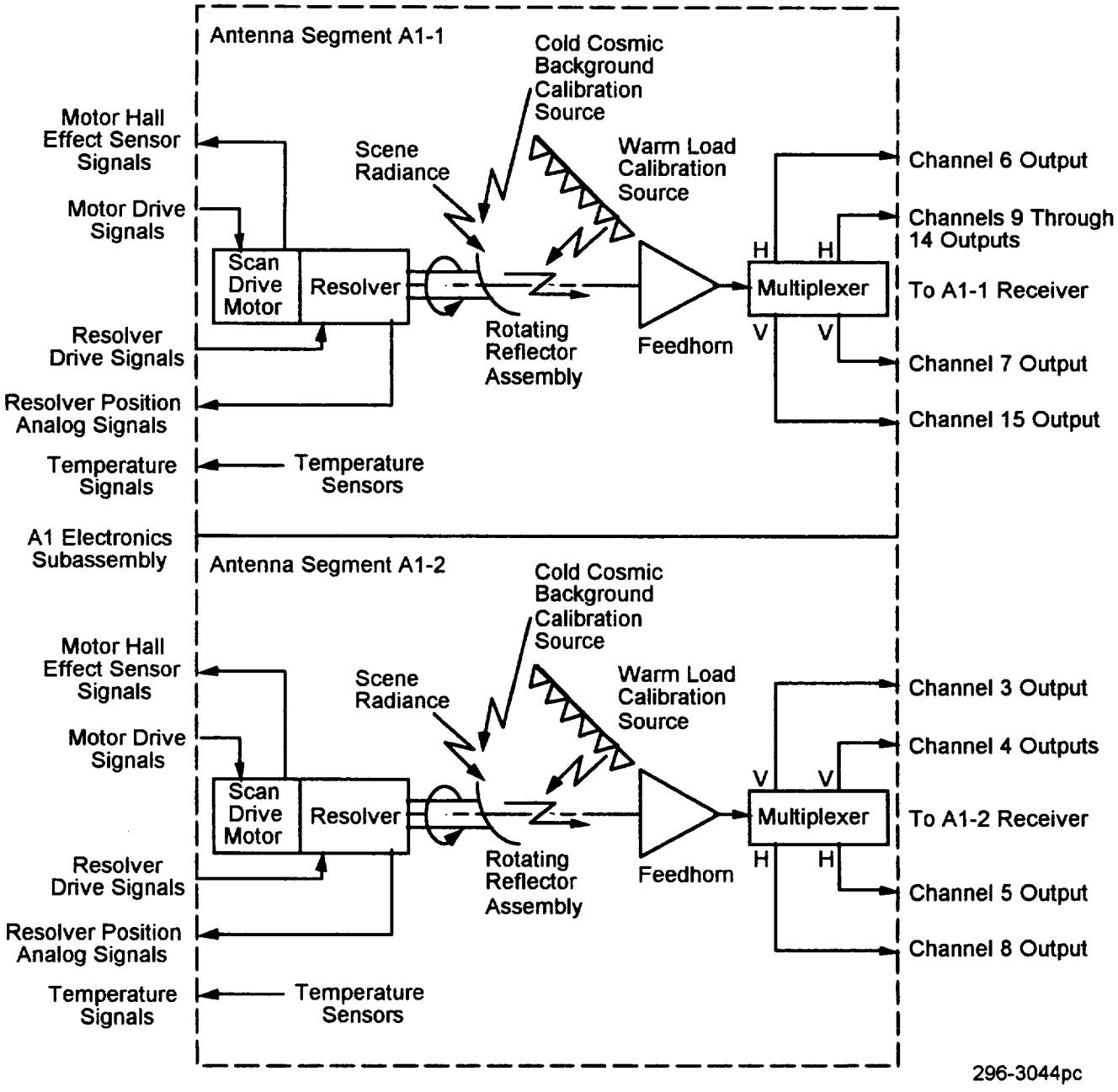


Figure 17 AMSU-A1 Antenna Functional Block Diagram

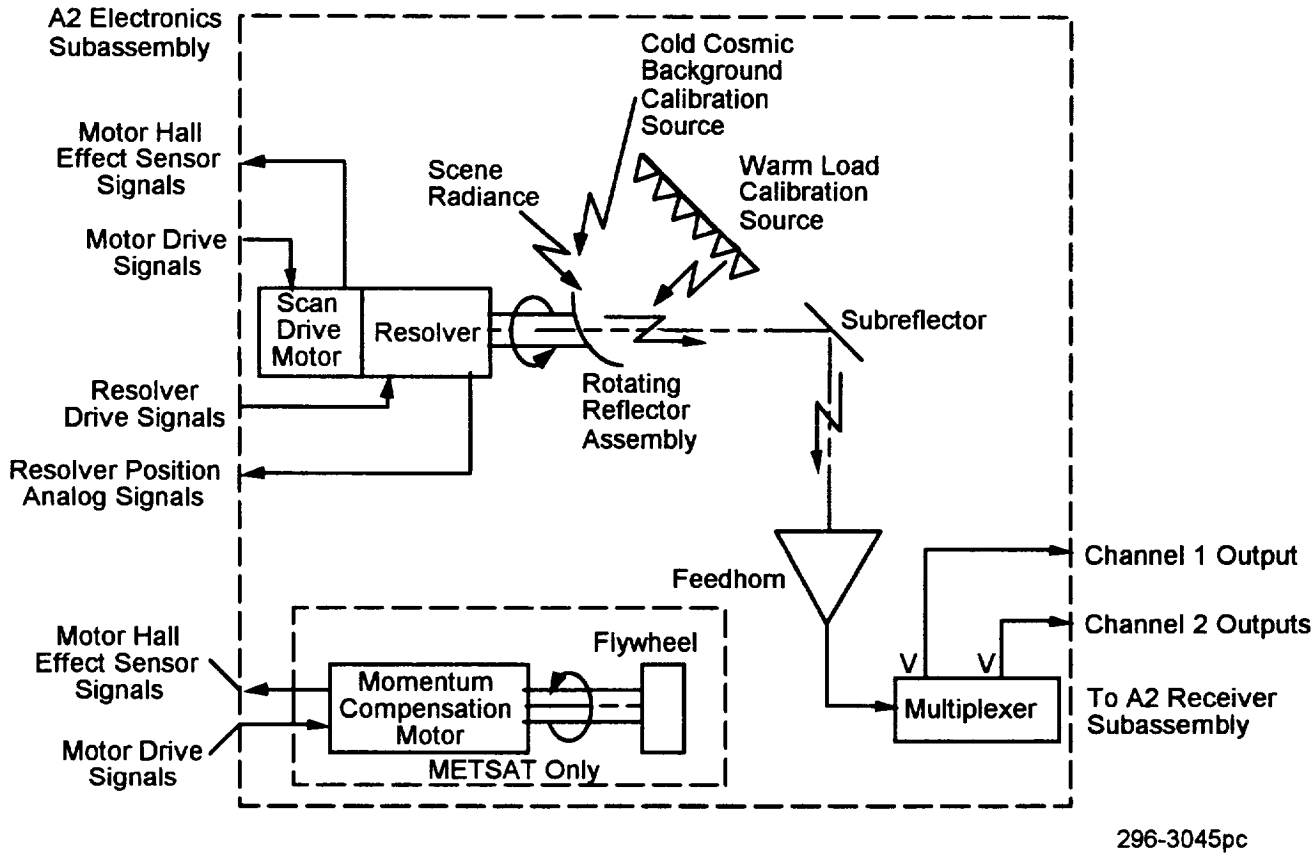


Figure 18 AMSU-A2 Antenna Functional Block Diagram

7.2 *AMSU-A Functional Description for the EOS Instrument*

7.2.1 *Antenna Functions*

The cross-track scanning of the Earth scene is accomplished in a stepped fashion with a dwell of 165 msec for AMSU-A1 and 158 msec for AMSU-A2 at each of the 30 Earth-viewing angles, and a dwell of 330-ms for AMSU-A1 and 316-ms for AMSU-A2 at the cold and warm calibration angles. Scanning of the antenna is accomplished in a rapid-step fashion. A complete rotation of the antenna is accomplished in 8 seconds. During each rotation of the AMSU-A antennas, the AMSU-A modules are calibrated with a cold reference by a view of the 3 K cosmic background radiation and a warm reference by a view of a target at a nominal 300 K temperature.

The antenna assembly is rotated using brushless DC torque motors with precision duplex ball bearing sets. The motors use brushless resolvers for position indication.

Each antenna subassembly is configured with a shrouded parabolic reflector assembly that feeds a wideband corrugated conical horn to provide a symmetrical beam and high beam efficiency. A closed path calibration system provides a completely shrouded path to the calibration target that eliminates extraneous signals.

7.2.2 *Receiver Functions*

Within the electronics subassembly are the radiometer receiver and the signal processor. To maximize the system temperature sensitivity, each receiver is a total power, superheterodyne configuration that uses either a dielectric resonator oscillator (DRO), phase-locked oscillator (PLO), or Gunn diode oscillator (GDO).

The mixers, in conjunction with the local oscillators, down convert the incoming radio frequencies (RF) at the antenna to intermediate frequencies (IF). Predetection gain and passband characteristics are achieved by IF amplifiers and the bandpass filters. Channel center frequency stabilization is provided by highly stable LO. A PLO which is referenced to the harmonic of a crystal oscillator provides the frequency stability required in Channels 9 through 14.

The gain of the IF amplifiers is selected to provide an optimum power level for the square-law detectors. Symmetric passbands for Channels 11 through 14 are established in the MHz frequency region to generate the identical RF signal spectra. The dual-summed surface acoustic wave (SAW) filters provide a $\sqrt{2}$ sensitivity improvement in these channels. The SAW filters provide sharp skirts and required center frequency stability. The square-law detectors convert receiver output power to a dc current equivalent of brightness temperature.

7.2.3 *Data Processing - Multiplexing Functions*

From square law detector outputs, processor subsystems provide radiometric temperature, thermometric temperature, and housekeeping data to the spacecraft system; the subsystems also provide command processing and control timing for all periodic functions of the instruments.

DC video amplifiers amplify low-level detector signals to levels sufficient for subsequent processing. Video amplifiers are contained in shielded enclosures along with the square law detectors. Following video amplification, an offset voltage is added to obtain placement of the system transfer characteristic at the desired position within the range of the A/D converter. The integrate-and-dump (I&D) filters integrate video signals during each beam dwell period (165 ms for A1, 158 ms for A2), hold the integrated levels during digitization, and dump to zero prior to the next beam dwell period. Brightness temperature isolation between scene stations is provided by resetting the filters.

A 16-bit A/D converter digitizes all scene, calibration, and instrument thermometric temperatures for eventual serial readout to the spacecraft. Inputs to the A/D converter are selected by the analog multiplexers, controlled by a microcomputer. During scene and calibration periods, multiplexers switch to I&D filter outputs. Between calibration periods, the multiplexer switches to platinum resistance thermister (PRT) voltages.

The A/D converter digitizes I&D filter outputs during hold intervals and PRT voltages between calibration periods. The microcomputer sequentially transfers data from the A/D converter to the spacecraft.

The A/D converter range accommodates long-term channel gain variations and the resolution provides digitization noise components within system ΔT budgets.

7.2.4 *Temperature Monitoring*

Thermometric temperatures of microwave components and other critical AMSU-A items are provided by precision PRT sensors and calibrated conditioning circuits. Conditioned PRT voltages are digitized and read out to the spacecraft along with radiometric temperature data.

7.2.5 *Central Processing Unit (CPU) and Control (Microcomputer)*

All processing, clock, command, and telemetry functions of the AMSU-A are controlled within the signal processing section of the electronic subassembly by a space-qualified, radiation-hardened microprocessor.

The digital processor consists of microprocessor-based circuits for data control, frame timing, and reflector interface control.

By means of address and data busses, the microprocessor controls all data operations within the radiometer processing subsystem. During the scene segment of each reflector scan, digitized scene radiometric temperature data of Channels 3 through 15 in the A1 module, Channels 1 and 2 in the A2 module, and antenna position data are processed by the microcomputer. The microcomputer consists of five circuit card assemblies (CCA): (1) CPU, (2) memory, (3) scan control, (4) timing control generation (TCG), (5) MIL-STD-1553 interface. A description of these CCA is provided in Table II. In processing instrument data, the CPU, through the TCG, commands the analog MUX. This converts parallel analog data into a serial stream for conversion to digital format by the A/D converter. The digital data are sent back to the TCG which transfers them to the microprocessor data bus. The CPU routes the data to the MIL-STD-1553 interface where two successive frames are stored in first in, first out (FIFO) memory and random access memory (RAM). The spacecraft can extract the data from the RAM asynchronously.

To control the antenna, the CPU gets position data from the memory and routes a position command through the scan control latch in the motor circuit(s). A strobe signal from the TCG transfers the position data to a digital comparator where digitized resolver position data subtracted from it. The difference signal (the position error) is converted into analog form and drives the motor to the new position.

The microprocessor and other complementary metal oxide semiconductor (CMOS) logic except for the MIL-STD-1553 interface microcircuit operates from +5 Vdc to minimize power consumption, and has response sufficient to complete all data control requirements with considerable time margin. The MIL-STD-1553 microcircuit uses both +5 Vdc and -15 Vdc.

7.2.6 *Clock and Command*

The analog multiplexer input selection, integrate, hold, and dump intervals, and digitization and reflector stepping functions are controlled by the microcomputer. The CPU operates from an internally generated clock pulse of 1.248 MHz. The DC/DC converter is synchronized to this frequency.

An 8-second pulse provided by the spacecraft via the MIL-STD-1553 bus initiates each scan cycle. Circuits on the MIL-STD-1553 interface CCA extract these data and supply them to the CPU.

Since Channels 9 through 14 of the AMSU-A1 unit use a phase locked oscillator (PLO) with a redundancy; a command is available to select the redundancy to be used. Two scanner power commands independently control power to the AMSU-A1 scan subsystems. The AMSU-A2 scan subsystem also has a commanded power input.

The precise position of the reflector during cold calibration (i.e. when it is staring into cold space) is also controllable. Four discrete calibration positions are available by setting two command bits high or low.

7.2.7 *Test Points and Telemetry*

The EOS/AMSU-A instrument provides test points and analog telemetry outputs. The analog multiplexer inputs and the A/D converter analog input are resistor-buffered and brought out to a test connector to aid in troubleshooting. Analog telemetry (engineering data) provides analogs of supply voltages, bus currents, and temperatures. Digital engineering data include instrument mode, scan power and PLO power relay status, PLO lock status, and A/D converter latchup indicator. These data are multiplexed once per scan, and output on the MIL-STD-1553 interface.

7.2.8 *Temperature Monitoring*

Twelve resistor temperature sensor networks on AMSU-A1, and six on AMSU-A2, input to the spacecraft the passive analog telemetry to provide temperature data independent of instrument operational status. Power bus redundancy monitor outputs are also provided to the spacecraft passive analog interface.

7.2.9 *Input Filter, DC/DC Converter, and Relay Control*

From the redundant +28-volt spacecraft quiet power bus, AMSU-A power systems provide regulated voltages to receiver and radiometer processor subsystems. Redundant reflector scanning motors operate from the +28-volt noisy power bus.

Power on/off control is not provided by the AMSU-A modules; switching between the bus redundancies is automatically performed by relay circuits in the instrument.

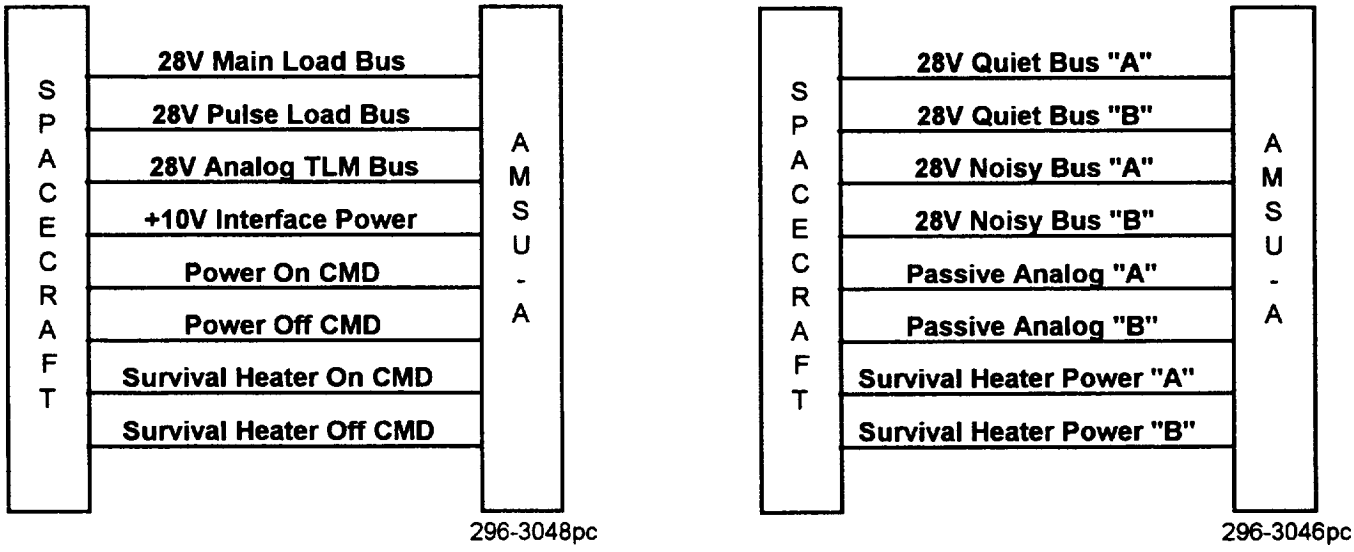
A single DC/DC converter in each unit provides receiver and radiometer processor voltages isolated from the +28-volt bus. The DC/DC converter is synchronized to the 1.248 MHz CPU clock. The DC/DC converter provides regulated output of +15 volts, -15 volts, +8 volts, +5 volts, and +10 volts. The mixer/IF amplifiers share a common +10-volt output. A common +8-volt output supplies receiver IF amplifier power. ±15 V outputs supply power to video amplifiers and other analog circuitry of the radiometer processor. The +5-volt output is utilized for the data processing functions of the radiometer processor subsystem. Additional isolated ±15 V and +5V supplies are provided for the scan drive subsystem. The PLO on AMSU-A1 also has independent ± 15 V supplies.

In the absence of the clock signal, the converter will run asynchronously. Input diodes protect the converter from polarity reversal damage. DC/DC converter output voltage regulation is maintained for main power bus input voltages of +24 to +35 volts. Above +40 volts, the converter will shut down.

Scan motors operate from the noisy +28-volt bus. Power to the scan motors is controlled by means of latching relays controlled by the scanner power command.

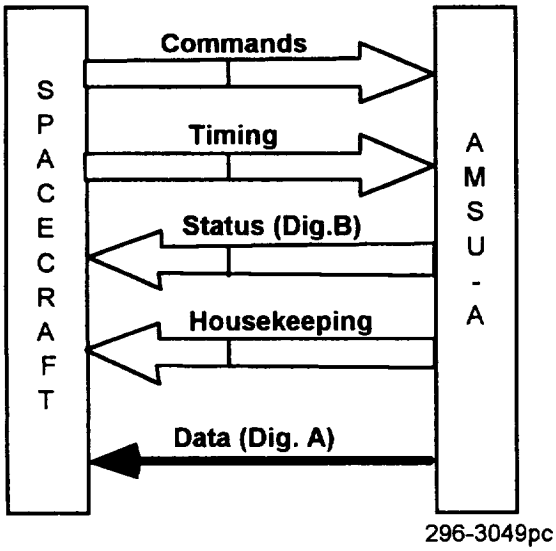
7.3 *Description of METSAT/EOS Unique Functions/Hardware*

The major differences between METSAT and EOS AMSU-A instruments are the Power Interfaces and Signal Interfaces with the spacecraft. As shown in Figure 19 the EOS power interface has been improved to take advantage of the spacecraft "quiet" 28 volt supply bus. The "quiet" bus reduces instrument internal noise generation and improved producibility and "safe-to-mate" capability. To implement the power interface improvement required a change in the METSAT power relay and housekeeping circuit card assembly, thus creating a power control and monitoring circuit card assembly for the EOS instrument. The new EOS power control and monitoring circuit card assembly has automatic input power sense and select functions. As shown in Figure 20, the EOS signal interface compared to METSAT has been changed to take advantage of the spacecraft MIL-STD-1553 data bus interface and elimination of the external 1.248 MHz clock interface. This change deleted the METSAT spacecraft interface circuit card assemblies from the EOS design and replaced them with a MIL-STD-1553 interface circuit card assembly.

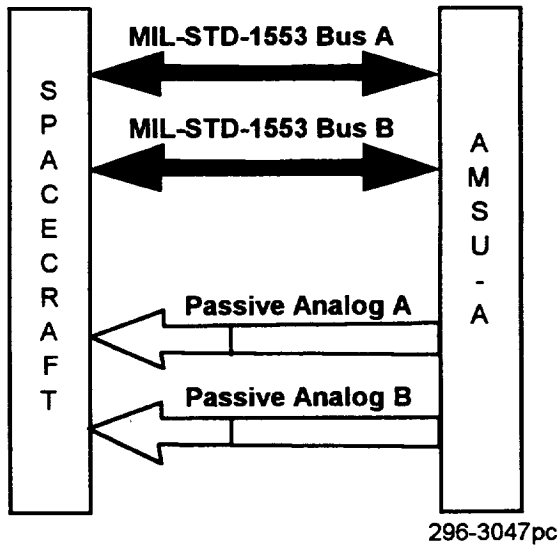


Power Interface for METSAT **Power Interface for EOS**

Figure 19 Power Interface Differences



Signal Interface for METSAT



Signal Interface for EOS

Figure 20 Signal Interface Differences

Section 8

ABBREVIATIONS/ACRONYMS

A/D	Analog/Digital
Amp	Amplifier
AMSU	Advanced Microwave Sounding Unit
Attn	Attenuator
BPF	Bandpass Filter
Calib	Calibration
CCA	Circuit Card Assembly
CMOS	cOMPLEMENTARY Metal Oxide Semiconductor
CPU	Central Processing Unit
DET	Detector
EOS	Earth Observing System
FIFO	First In, First Out
GFSC	Goddard Space Flight Center
IF	Intermediate Frequency
ISO	Isolator
I&D	Integrate and Dump
LO	Local Oscillator
METSAT	Meteorological Satellites
MUX	Multiplexer
PLO	Phase-Locked Oscillator
PRT	Platinum Resistance Thermistor
RAM	Random Access Memory
R/D	Resolver/Digital Converter
SAW	Surface Acoustic Wave
TCG	Timing Control Generator
Typ	Typical

APPENDIX A

METSAT/EOS

RELIABILITY PREDICTIONS

APPENDIX A
SECTION A1
METSAT/EOS
AMSU-A MODULE A1
RELIABILITY PREDICTIONS

Table A1AS METSAT/EOS Module A1
Antenna Subsystem

Nomenclature	Part Number	Quantity (n)	λ ($f/10^6$ hr)	nλ	λ Source/Remarks
Antenna Assembly	1356403-1	1	0.75206	0.75206	Table A1AS-1
Multiplexer	1331546-1	1	0.38243	0.38243	AE-24689B
Muliplexer	1331507-1	1	0.38243	0.38243	AE-24689B

Total METSAT/EOS λ = 1.51692

Table A1AS-1 METSAT/EOS Module A1
Antenna Assembly P/N 1356403-1

Nomenclature	Part Number	Quantity (n)	λ ($f/10^6$ hr)	nλ	λ Source/Remarks
Drive Assy, Reflector	1333640-1	2	0.36703	0.73406	Table A2AS-1-1
Calibration Source and PRTS	1331380-1	2	0.008	0.016	Table A2AS-1
Feedhorn Assembly A1-2	1331361-1	1	0.001	0.001	Aerojet Report 8897-1
Feedhorn Assembly A1-1	1331410-1	1	0.001	0.001	Aerojet Report 8897-1

Total λ = 0.75206

Table A1RS METSAT/EOS Module A1 Receiver Subsystem

Nomenclature	Part Number	Quantity (n)	λ ($f/10^6$ hr)	nλ	λ Source/Remarks
Common Receiver Elements					
Thermofoil Heater	1337640-3	2	1.7E-6	3.4E-6	NPRD-91
Connector	311P409-4P-B-12	1	0.0005	0.0005	Eng Estimate
Thermostatic Swtich	1337651-1	2	0.00013	0.00026	NPRD-91
Connector	AS8381-04-(G04NA	1	0.0005	0.0005	Eng Estimate
Connector	AS8381-04-F04NA	1	0.0005	0.0005	Eng Estimate
Channel 6 Receiver Elements					
Isolator	1336680-4	1	0.0114	0.0114	AE-26025B
54.4 GHz DRO	1336610-6	1	0.0260	0.0260	AE-24682D
Waveguide Attenuator	1331508-4	1	0.00761	0.00761	AE-26110
Mixer/IF Amplifier	1331562-16	1	0.1923	0.1923	Spacek Labs
Bandpass Filter (10-200 MHz)	1331559-2	1	0.0381	0.0381	AE-24687C
IF Attenuator	1331516-X	1	0.0114	0.0114	AE-24868
RF Cable Connectors	SMA Type	3 pair	0.003	0.009	Aerojet Report 8897-1
Channel 7 Receiver Elements					
Isolator	1356680-5	1	0.0114	0.0114	AE-26025B
54.94 GHz DRO	1336610-7	1	0.0260	0.0260	AE-24682D
Waveguide Attenuator	1331509-5	1	0.00761	0.00761	AE-26110
Mixer/IF Amplifier	1331562-17	1	0.1923	0.1923	Spacek Labs
Bandpass Filter (10-200 MHz)	1331529-2	1	0.0381	0.0381	AE-24687C
IF Attenuator	1331516-X	1	0.0114	0.0114	AE-24868
RF Cable Connectors	SMA Type	3 pair	0.003	0.009	Aerojet Report 8897-1
Channel 15 Receiver Elements					
Isolator	1356680-8	1	0.0114	0.0114	AE-26025B
89.0 GHz DRO	1336610-10	1	0.1213	0.1213	AE-24682D
Waveguide Attenuator	1331509-9	1	0.00761	0.00761	AE-26110
Mixer/IF Amplifier	1331562-20	1	0.1923	0.1923	Spacek Labs
Bandpass Filter (500-11500 MHz)	1331559-1	1	0.0381	0.0381	AE-24687C
IF Attenuator	1331516-X	1	0.0114	0.0114	AE-24868
RF Cable Connectors	SMA Type	3 pair	0.003	0.009	Aerojet Report 8897-1
Receiver Channels 9-14 Common Elements					
Isolator	1356680-7	1	0.0114	0.0114	AE-26025B
Phase-Locked Oscillator Assy (Redundant)		1	0.0131	0.0131	Table A1RS-1
Waveguide Attenuator	1331510-1	1	0.00761	0.00761	AE-24868
Mixer/IF Amplifier	1331562-19	1	0.2125	0.2125	Spacek Labs
Power Divider, 3-Way	1356669-1	1	0.53649	0.53649	AE-24867-2

Continued

Table A1RS METSAT/EOS Module A1 (Cont.)
Receiver Subsystem

Nomenclature	Part Number	Quantity (n)	λ (f/10^6 hr)	nλ	λ Source/Remarks
Receiver Channel 9					
IF Amplifier	1331579-9	1	0.0731	0.0731	AE-24684C
Bandpass Filter	1331559-4	1	0.0381	0.0381	AE-24687C
IF Attenuator	1331516-X	1	0.0114	0.0114	AE-24868
RF Cable Connectors	SMA Type	3 pair	0.003	0.009	Aerojet Report 8897-1
Receiver Channel 10					
IF Amplifier	1331579-9	1	0.0731	0.0731	AE-24684C
Bandpass Filter	1331559-7	1	0.0381	0.0381	AE-24687C
IF Attenuator	1331516-X	1	0.0114	0.0114	AE-24868
RF Cable Connectors	SMA Type	3 pair	0.003	0.009	Aerojet Report 8897-1
Receiver Channels 11-14 Common Elements					
IF Amplifier	1331579-7	1	0.007184	0.007184	AE-24684C
4-Way Power Divider	1356670	1	0.53649	0.53649	AE-24867-3
Receiver Channel 11					
SAW Filter	1331576-1	1	0.25988	0.25988	Phonon
IF Amplifier	1331579-10	1	0.1754	0.1754	AE-24684C
IF Attenuator	1331516-X	1	0.0114	0.0114	AE-24868
RF Cable Connectors	SMA Type	3 pair	0.003	0.009	Aerojet Report 8897-1
Receiver Channel 12					
SAW Filter	1331576-2	1	0.25988	0.25988	Phonon
IF Amplifier	1331579-11	1	0.1808	0.1808	AE-24684C
IF Attenuator	1331516-X	1	0.0114	0.0114	AE-24868
RF Cable Connectors	SMA Type	3 pair	0.003	0.009	Aerojet Report 8897-1
Receiver Channel 13					
SAW Filter	1331576-3	1	0.25988	0.25988	Phonon
IF Amplifier	1331579-12	1	0.1700	0.1700	AE-24684C
IF Attenuator	1331516-X	1	0.0114	0.0114	AE-24868
RF Cable Connectors	SMA Type	3 pair	0.003	0.009	Aerojet Report 8897-1
Receiver Channel 14					
SAW Filter	1331576-4	1	0.25988	0.25988	Phonon
IF Amplifier	1331579-13	1	0.2001	0.2001	AE-24684C
IF Attenuator	1331516-X	1	0.0114	0.0114	AE-24868
RF Cable Connectors	SMA Type	3 pair	0.003	0.009	Aerojet Report 8897-1
Common Elements, Receiver Assembly, A1-2 (P/O 1356409-1)					
Thermofoil Heater	1337640-3	2	1.7E-6	3.4E-6	MPRD-9S
Thermostatic Switch	1337651-1	2	0.00013	0.00026	NPRD-91
Connectors	AS8381-04-F04NA	1	0.0005	0.0005	Eng Estimate
Connectors	311P409-1P-B-12	1	0.0005	0.0005	Eng Estimate
Connectors	AS8381-04-D04NA	1	0.0005	0.0005	Eng Estimate

(Continued)

Table A1RS METSAT/EOS Module A1 (Cont.)
Receiver Subsystem

Nomenclature	Part Number	Quantity (n)	λ (f/10^6 hr)	nλ	λ Source/Remarks
Receiver Channel 3					
Isolator	1356680-1	1	0.0114	0.0114	AE-26025B
Waveguide Attenuator	1331509-1	1	0.0076	0.0076	AE-26110
50.3 GHz DRO	1336610-3	1	0.0260	0.0260	AE-24682D
Mixer/IF Amplifier	1331562-13	1	0.1923	0.1923	Spacek Labs
IF Bandpass Filter	1331559-3	1	0.0381	0.0381	AE-24687C
IF Attenuator	1331516-X	1	0.0114	0.0114	AE-24868
RF Cable Connectors	SMA Type	3 pair	0.003	0.009	Aerojet Report 8897-1
Receiver Channel 4					
Isolator	1356680-2	1	0.0114	0.0114	AE-26025B
Waveguide Attenuator	1331509-2	1	0.0076	0.0076	AE-26110
Stable Oscillator (52.8 GHz)	1336610-4	1	0.0260	0.0260	AE-24682D
Mixer/IF Amplifier	1331562-14	1	0.1923	0.1923	Spacek Labs
IF Bandpass Filter	1331559-2	1	0.0381	0.0381	AE-24687C
IF Attenuator	1331516-X	1	0.0114	0.0114	AE-24868
RF Cable Connectors	SMA Type	3 pair	0.003	0.009	Aerojet Report 8897-1
Receiver Channel 5					
Isolator	1356680-3	1	0.0114	0.0114	AE-26025B
Waveguide Attenuator	1331509-3	1	0.0076	0.0076	AE-26110
53.956 GHz DRO	1336610-5	1	0.0260	0.0260	AE-24682D
Mixer/IF Amplifier	1331562-15	1	0.1923	0.1923	Spacek Labs
IF Bandpass Filter	1331559-5	1	0.0381	0.0381	AE-24687C
IF Attenuator	1331516-X	1	0.0114	0.0114	AE-24868
RF Cable Connectors	SMA Type	3 pair	0.003	0.009	Aerojet Report 8897-1
Receiver Channel 8					
Isolator	1356680-6	1	0.0114	0.0114	AE-26025B
Waveguide Attenuator	1331509-6	1	0.0076	0.0076	AE-26110
55.5 GHz DRO	1336610-8	1	0.0260	0.0260	AE-24682D
Mixer/IF Amplifier	1331559-4	1	0.1923	0.1923	Spacek Labs
IF Bandpass Filter	1331559-2	1	0.0381	0.0381	AE-24687C
IF Attenuator	1331516-X	1	0.0114	0.0114	AE-24868
RF Cable Connectors	SMA Type	3 pair	0.003	0.009	Aerojet Report 8897-1

Total A1RS-METSAT/EOS λ = 5.6318

TABLE A1RS-1

Standby Redundancy Calculation for the Hybrid Tee/PLO System

The PLO/Hybrid Tee subsystem operates in a standby redundant arrangement which connects the standby PLO Assembly to the Mixer/IF amplifier used for Channels 9 through 14. The system life X may be represented as the sum of the subsystem lives, $X = X_1 + X_2$.

$$F(x) = 1 - \sum \frac{e^{-\lambda x}(\lambda x)^k}{k!}$$

The probability that the system will operate at least x hours is denoted by R(x), the reliability function for the PLO assembly alone is:

$$\begin{aligned} R(x) &= 1 - F(x) \\ &= \sum_{k=0}^{1} \frac{e^{-\lambda x}(\lambda x)^k}{k!} \\ &= e^{-\lambda x}(1 + \lambda x) \\ &= e^{-[0.7014 \cdot 10^{-6}(26,280)}[1 + 0.7014 \times 10^{-6}(26,280)] \\ &= 0.9998 \end{aligned}$$

the reliability function for the Switching Relay is:

$$\begin{aligned} R(x) &= e^{-\lambda x}(1 + \lambda x) \\ &= e^{-[0.00313 \cdot 10^{-6}(26,280)} \\ &= 0.9998 \end{aligned}$$

Combining the failure rates, we get:

$$\begin{aligned} R_{PLO}R_{RELAY} &= 0.99992(0.9998) \\ &= 0.9998 \end{aligned}$$

for the redundant PLO/Hybrid Tee system.

Which results in a PLO/Hybrid Tee System failure rate (λ) of:

$$\begin{aligned} \lambda_{SYS} &= \frac{-\ell n(R_{SYS})}{t} \\ &= \frac{-\ell n(0.9998)}{26,280 hrs} \\ &= 9.43 \times 10^{-3} \text{ failures per million hours.} \end{aligned}$$

TABLE A1RS-1 (Cont.)

Environment: SF Temperature: 30°C

Part Number	Description	Ref/Qty	Failure Rate	Reliability	
1348351-1	VCGDO/Harmonic Mixer	1	0.02374	0.99938	
1348400-1	DRO Assembly	1	0.24687	--	
1348420-1	Regulator CCA	1	0.04580	--	
1348500-1	PLL Assembly	1	0.19664	--	
1348325-1	TCXO	1	0.07410	0.99805	FEI Report
M39016/35-006	Relay, Latching, 4PDT	1	0.00313		

				Source
1348430-1	Cable Assembly, RF	1	0.00564	Mil-217F
1348430-2	Cable Assembly, RF	1	0.00564	
1348430-3	Cable Assembly, RF	1	0.00564	
1348435-1	Cable Assembly, RF	1	0.00564	
1348435-2	Cable Assembly, RF	1	0.00564	
1348435-3	Cable Assembly, RF	1	0.00564	Mil-217F

			Failure Rate		
Part Number	Description	Ref/Qty	Total	Unit	Source
1007-7985-00	Connector	1	0.02500	0.025	NPRD-91
M28861/06-002SB	Feedthru	6	0.00321	0.0005	Mil-217
1084-1100-02	Connector	1	0.02500	0.025	NPRD-91
RER60F10R0R	Resistor,10-ohm, 5W	1	0.02722	0.02722	Mil-217

Total Failure Rate: 0.7045

TABLE A1RS-1 (Cont.)

		Qty/Ref	Failure Rate	% Assembly
1348410-1	DRO CCA	1	0.14727	59.65
1348440-1	Loop Amplifier CCA	1	0.01158	4.69
1348450-1	573 MHZ Amplifier CCA	1	0.03749	15.19
M28861/06-002SB	Feedthru	1	0.00054	0.22
1052-3121-00	Jack, Connector	1	0.025	10.13
4052-0000-00	Connector	1	0.025	10.13

Assembly Failure Rate: 0.2469

Part Number: 1348400

DRO Assembly

TABLE A1RS-1 (Cont.)

Diodes, High Frequency (Microwave Detector)

Part Number	Ref/Qty	Description	Failure Rate	λb	πT	πA	πR	πQ	πE
MV3110-26	CR1	Varactor	0.00079	0.0025	1.26	1.0	1.0	0.5	0.50
MSPD1012-E50	CR2	Sampling Phase Detector	0.00905	0.027	1.34	1.0	1.0	0.5	0.50

Transistors, High Frequency, Bipolar

Part Number	Ref/Qty	Description	Failure Rate	λb	πT	πR	πS	πQ	πE
NE243187	Q1	Medium Power Oscillator	0.08471	0.18	3.41	1.5	0.4	0.5	0.50

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Failure Rate	λb	πR	πQ	πE
M55342K02U470DR	2	470, Chip, 50mW	5.00E-05	0.00125	1.0	0.1	0.20
M55342K02U2E74R	R2	2.74K, Chip, 50mW	2.50E-05	0.00125	1.0	0.1	0.20
M55342K02U200DR	R3	200, Chip, 50mW	2.50E-05	0.00125	1.0	0.1	0.20
M55342K02U13D0R	R4	13.0, Chip, 50mW	2.50E-05	0.00125	1.0	0.1	0.20
CR05S/100	R5-R10	100 ohms	1.50E-04	0.00125	1.0	0.1	0.20
M55342K02U1E00R	R11,R12	1.00K, Chip, 50mW	5.00E-05	0.00125	1.0	0.1	0.20

Capacitors, Fixed, Ceramic

Part Number	Ref/Qty	Description	Failure Rate	λb	πCV	πQ	πE
D35NS100J1LA	C1,C2	100pF, 50V	1.05E-05	0.00064	0.68	0.03	0.40
M123A10BPB102KS	C3	1000F, 50V, Est. Rel.	1.02E-05	0.00097	0.88	0.03	0.40

Interconnection Assemblies with PTHs

Part Number	Ref/Qty	Description	Failure Rate	λb	πC	πQ	πE	N1	N2
1348411-1	1	Printed Wiring Board	0.00238	1.7E-05	1.0	1	0.50	0	20

Miscellaneous, Isolator (<100W)

Part Number	Ref/Qty	Description	Failure Rate	Constant	πE
F96101/6875	Iso	Isolator, Microwave	0.05	0.10	0.50

Assembly Failure Rate: 0.14727

TABLE A1RS-1 (Cont.)

Diodes, High Frequency (Microwave D			Junct.	θjc	Actual	Rated		
Part Number	Ref/Qty	Appl	Temp.	(°C/W)	Power	Power	Quality	Schottky
MV3110-26	CR1	Other	35.00	70	10.0E-6	1	JANTXV	N
MSPD1012-E50	CR2	Other	37.94	70	0.042	1	JANTXV	Y

Transistors, High Frequency, Bipolar		Junct.	θjc	Actual	Rated	Op. Freq	Vce	Vceo		
Part Number	Ref/Qty	Temp.	(°C/W)	Power	Power	(GHz)	Applied	Max	Case	Quality
NE243187	Q1	87.39	30	0.913	2.75	6.8	11	16	Outline 87	JANTXV

Resistors, Fixed, Film			Rated	Actual	
Part Number	Ref/Qty	Ohms	Power	Power	Quality
M55342K02U470DR	2	470	0.050	0.001	R
M55342K02U2E74R	R2	2740	0.050	0.001	R
M55342K02U200DR	R3	200	0.050	0.001	R
M55342K02U13D0R	R4	13	0.050	0.001	R
CR05S/100	R5-R10	100	0.050	0.001	R
M55342K02U1E00R	R11,R12	1000	0.050	0.001	R

Capacitors, Fixed, Ceramic		Rated	Actual		Rated	
Part Number	Ref/Qty	Volts	Volts	pF	Temp	Quality
D35NS100J1LA	C1,C2	50	2	100	125	S
M123A10BPB102KS	C3	50	12	1000	125	S

Interconnection Assemblies with PTHs						
Part Number	Ref/Qty	Layers	Quality		Wave Solder	Hand Solder
1348411-1	1	2	Mil	PTHs->	0	20

Miscellaneous, Isolator (<100W)			
Part Number	Ref/Qty	Spec. Reliability	FR from Rel.
F96101/6875	Iso	0.9997	0.01142

PLO.XLS
05/09/95

TABLE A1RS-1 (Cont.)

Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Failure Rate	πT	πE	πQ	πL	C1	C2
OP22	U1	Operational Amplifier	0.00133	0.44	0.50	0.25	1.0	0.010	0.0020
M38510/11202SGC	U2	Voltage Comparator	0.00196	0.69	0.50	0.25	1.0	0.010	0.0020

Diodes, Low Frequency

Part Number	Ref/Qty	Description	Failure Rate	λb	πT	πS	πC	πQ	πE
JANTVX1N914	CR1	Switching, Ultrastable	0.00186	0.0038	1.40	1.0	1.0	0.70	0.50

Transistors, Low Frequency, Bipolar

Part Number	Ref/Qty	Description	Failure Rate	λb	πT	πA	πR	πS	πQ	πE
JANTXV2N2907A	Q1,Q2	General Purpose Amp/Switch	2.59E-06	0.00074	1.26	1.5	1.24	0.21	0.7	0.50

Resistors, Fixed, Film, Est. Rel.

Part Number	Ref/Qty	Description	Failure Rate	λb	πR	πQ	πE
M55342K02B2E74R	R1,R2	2.74K, Fixed Film, Chip, 50mW	5.00E-05	0.00125	1.0	0.1	0.20
M55342K02B10E0R	2	10.0K, Fixed Film, Chip, 50mW	5.00E-05	0.00125	1.0	0.1	0.20
M55342K02B100DR	R4	100, Fixed Film, Chip, 50mW	2.50E-05	0.00125	1.0	0.1	0.20
M55342K03B1F00R	R5,R6	1.00M, Fixed Film, Chip, 50mW	1.50E-05	0.00125	1.0	0.03	0.20
M55342K02B31E6R	R7	31.6K, Fixed Film, Chip, 50mW	2.50E-05	0.00125	1.0	0.1	0.20
M55342K02B61E0R	R8	61.0K, Fixed Film, Chip, 50mW	2.50E-05	0.00125	1.0	0.1	0.20
M55342K02B30E1R	R9	30.1K, Fixed Film, Chip, 50mW	2.50E-05	0.00125	1.0	0.1	0.20
M55342K02B39E2R	R10	39.2K, Fixed Film, Chip, 50mW	2.50E-05	0.00125	1.0	0.1	0.20
M55342K02B22E1R	R11,R12	22.1K, Fixed Film, Chip, 50mW	5.00E-05	0.00125	1.0	0.1	0.20
M55342K02B8E06R	R13	8.06K, Fixed Film, Chip, 50mW	2.50E-05	0.00125	1.0	0.1	0.20
M55342K02B13E0R	R14	13.0K, Fixed Film, Chip, 50mW	2.50E-05	0.00125	1.0	0.1	0.20
M55342K02B100ER	R15	100K, Fixed Film, Chip, 50mW	2.75E-05	0.00125	1.1	0.1	0.20
M55342K02B27E4R	R16	27.4K, Fixed Film, Chip, 50mW	2.50E-05	0.00125	1.0	0.1	0.20
M55342K02B165ER	R17-R19	165K, Fixed Film, Chip, 50mW	8.26E-05	0.00125	1.1	0.1	0.20

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	Failure Rate	λb	πCV	πQ	πE
M123A10BPB101KS	C1	100 pF, 50V	1.31E-05	0.00128	0.68	0.030	0.50
M123A12BPB104KS	C2-C7	0.1uF, 50V	1.68E-04	0.00128	1.45	0.030	0.50
M123A10BPB102KS	C8,C9	1000pF, 50V	3.38E-05	0.00128	0.88	0.030	0.50
M123A10BPB331KS	C10	330pF, 50V	1.50E-05	0.00128	0.78	0.030	0.50
M123A10BPB151KS	C11	150pF, 50V	1.37E-05	0.00128	0.71	0.030	0.50

TABLE A1RS-1 (Cont.)

Capacitors, Fixed, Electrolytic, Aluminum

Part Number	Ref/Qty	Description	Failure Rate	λb	πCV	πQ	πE
CWR06KA155JR	C12	1.5uF, 50V	0.00034	0.01867	0.37	0.10	0.50

Interconnection Assemblies with PTHs

Part Number	Ref/Qty	Description	Failure Rate	λb	πC	πQ	πE	N1	N2
1348442-1	1	Printed Wiring Board	0.00536	1.7E-05	1.0	1	0.50	0	45

Assembly Failure Rate: 0.01158

TABLE A1RS-1 (Cont.)

Microcircuits, Gate/Logic Arrays and M					Junct.		θjc	
Part Number	Ref/Qty	Compl.	Tech.	Ea	Temp.	Watts	(°C/W)	Pins
OP22	U1	50	Bipolar	0.65	43.4	0.12	70	8
M38510/11202SGC	U2	50	Bipolar	0.65	49.52	0.66	22	8

Diodes, Low Frequency			Type/	Rated	Applied	Junct.	Actual	θjc
Part Number	Ref/Qty	Contact	Appl.	Voltage	Voltage	Temp.	Watts	°C/W
JANTVX1N914	CR1	Metal	Sw			35.003	0.0003	10

Transistors, Low Frequency, Bipolar		θjc	Junct.	Rated	Actual	Vce	Rated	Appl.
Part Number	Ref/Qty	(°C/W)	Temp.	Power	Power	Applied	Vceo	(Lin/Sw)
JANTXV2N2907A	Q1,Q2	70	35.21	1.8	0.003	1	2	

Resistors, Fixed, Film, Est. Rel.			Rated	Actual	
Part Number	Ref/Qty	Ohms	Power	Power	Quality
M55342K02B2E74R	R1,R2	2740	0.050	0.025	R
M55342K02B10E0R	2	10000	0.050	0.025	R
M55342K02B100DR	R4	100	0.050	0.025	R
M55342K03B1F00R	R5,R6	1000000	0.050	0.025	R
M55342K02B31E6R	R7	31600	0.050	0.025	R
M55342K02B61E0R	R8	61000	0.050	0.025	R
M55342K02B30E1R	R9	30100	0.050	0.025	R
M55342K02B39E2R	R10	39200	0.050	0.025	R
M55342K02B22E1R	R11,R12	22100	0.050	0.025	R
M55342K02B8E06R	R13	8060	0.050	0.025	R
M55342K02B13E0R	R14	13000	0.050	0.025	R
M55342K02B100ER	R15	100000	0.050	0.025	R
M55342K02B27E4R	R16	27400	0.050	0.025	R
M55342K02B165ER	R17-R19	165000	0.050	0.025	R

Capacitors, Fixed, Ceramic, General P			Rated	Rated	Actual	
Part Number	Ref/Qty	pF	Temp	Volts	Volts	Quality
M123A10BPB101KS	C1	100	125	50	15	S
M123A12BPB104KS	C2-C7	100000	125	50	15	S
M123A10BPB102KS	C8,C9	1000	125	50	15	S
M123A10BPB331KS	C10	330	125	50	15	S
M123A10BPB151KS	C11	150	125	50	15	S

TABLE A1RS-1 (Cont.)

Capacitors, Fixed, Electrolytic, Alumin

Part Number	Ref/Qty	Rated Volts	Actual Volts	uF	Rated Temp	Quality
CWR06KA155JR	C12	50	15	1.5	125	R

Interconnection Assemblies with PTHs

Part Number	Ref/Qty	Planes	Quality		Wave Solder	Hand Solder
1348442-1	1	2	Mil	PTHs->	0	45

TABLE A1RS-1 (Cont.)

Diodes, Low Frequency

Part Number	Ref/Qty	Description	Failure Rate	λb	πT	πS	πC	πQ	πE
JANTXV1N752A	CR1	5.6V at 20mA	0.00087	0.002	1.24	1	1	0.7	0.5

Transistors, Low Frequency, Bipolar

Part Number	Ref/Qty	Description	Failure Rate	λb	πT	πA	πR	πS	πQ	πE
JANTXV2N2222A	Q1	Si NPN	0.00013	0.00074	1.28	1.5	1.24	0.21	0.7	0.50

Transistors, High Frequency, Bipolar

Part Number	Ref/Qty	Description	Failure Rate	λb	πT	πR	πS	πQ	πE
AT-42010	Q2	Medium Power	0.03420	0.18	3.18	0.828	0.29	0.5	0.5

Resistors, Fixed, Film, Est. Rel.

Part Number	Ref/Qty	Description	Failure Rate	λb	πR	πQ	πE
M55342K02B1E20R	R1	1.20K, Chip, 50mW	2.50E-05	0.001251	1	0.1	0.2
M55342K02B475DR	R2	475, Chip, 50mW	2.50E-05	0.001251	1	0.1	0.2
M55342K02B200DR	R3	200, Chip, 50mW	2.50E-05	0.001251	1	0.1	0.2

Capacitors, Fixed, Ceramic

Part Number	Ref/Qty	Description	Failure Rate	λb	πCV	πQ	πE
M123A10BPB102KS	C1-C5	1000pF, 50V	0.00024	0.003616	0.88	0.03	0.5
M123A12BPB104KS	C7	0.1uF, 50V	0.00008	0.003616	1.45	0.03	0.5

Capacitors, Fixed, Electrolytic, Aluminum

Part Number	Ref/Qty	Description	Failure Rate	λb	πCV	πQ	πE
CWR06KC685JR	C6	6.8uF, 50V	0.00045	0.018672	0.48	0.1	0.5

Coils, Radio Frequency

Part Number	Ref/Qty	Description	Failure Rate	λb	πC	πQ	πE
M83446/10-14	L1	Chip, Fixed, 0.120uH	6.65E-05	0.00044	1	0.3	0.50

Interconnection Assemblies with PTHs

Part Number	Ref/Qty	Description	Failure Rate	λb	pC	πQ	πE	N1	N2
1348452-1	1	Printed Wiring Board	0.00238	1.7E-05	1.01	1	0.5	0	20

Assembly Failure Rate: 0.03749

Part Number: 1348450

573 MHz Amplifier Circuit Card Assembly

Schematic: 1348451

TABLE A1RS-1 (Cont.)

Diodes, Low Frequency				Rated	Applied	Junct.	θjc	Actual	Rated	
Part Number	Ref/Qty	Contact	Type/App	Voltage	Voltage	Temp.	°C/W	Watts	Watts	Case
JANTXV1N752A	CR1	Metal	Zener	n/a	n/a	35.42	70	0.006	0.4	DO-35

Transistors, Low Frequency, Bipolar		Junct.	θjc	Actual	Rated	Vce	Vceo			
Part Number	Ref/Qty	Temp.	°C/W	Watts	Watts	Applied	Max	Case	Quality	
JANTXV2N2222A	Q1	35.7	70	0.01	1.8	1	2		JANTXV	

Transistors, High Frequency, Bipolar		Junct.	θjc	Actual	Rated	Freq.	Vce	Vceo		
Part Number	Ref/Qty	Temp.	°C/W	Watts	Watts	(GHz)	Applied	Max	Case	Quality
AT-42010	Q2	83	150	0.32	0.6	0.573	7.2	12		JANTXV

Resistors, Fixed, Film, Est. Rel.			Rated	Actual		
Part Number	Ref/Qty	Ohms	Watts	Watts	Quality	
M55342K02B1E20R	R1	1200	0.050	0.025	R	
M55342K02B475DR	R2	475	0.050	0.025	R	
M55342K02B200DR	R3	200	0.050	0.025	R	

Capacitors, Fixed, Ceramic			Rated	Actual	Rated	
Part Number	Ref/Qty	pF	Volts	Volts	Temp	Quality
M123A10BPB102KS	C1-C5	1000	50	15	125	S
M123A12BPB104KS	C7	100000	50	15	125	S

Capacitors, Fixed, Electrolytic, Alumi			Rated	Actual	Rated	
Part Number	Ref/Qty	uF	Volts	Volts	Temp	Quality
CWR06KC685JR	C6	6.8	50	15	125	R

Coils, Radio Frequency				Power		
Part Number	Ref/Qty	Hot Spot	DT	Loss (W)	Quality	
M83446/10-14	L1	30.21	0.194	100.0E-6	P	

Interconnection Assemblies with PTH						
Part Number	Ref/Qty	Planes	Quality		Wave Solder	Hand Solder
1348452-1	1	2	Mil	PTHs->	0	20

TABLE A1RS-1 (Cont.)

Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Failure Rate	πT	πE	πQ	πL	C1	C2
M38510/11703BXC	U1	Adjustable Voltage Regulator	0.00123	0.4769	0.5	0.25	1	0.01	0.0003
M38510/11703BXC	U2	Adjustable Voltage Regulator	0.02952	11.7953	0.5	0.25	1	0.01	0.0003
M38510/11502BXC	U3	Voltage Regulator, -12V at 0.5A	0.00696	2.7686	0.5	0.25	1	0.01	0.0003

Diodes, Low Frequency

Part Number	Ref/Qty	Description	Failure Rate	λb	πT	πS	πC	πQ	πE
JANTXV1N3611	CR1-CR5	(Reverse Voltage Protection)	0.00269	0.0038	1.4004	0.289	1	0.7	0.5

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Failure Rate	λb	πR	πQ	πE
M55342K02B243DR	R1, R2	243, Fixed Film, Chip, 50mW	5.00E-05	0.00125	1	0.1	0.2
1348426	R3, R4	Resistor Kit	5.00E-05	0.00125	1	0.1	0.2
M55342K02B2E26R	R5	2.26K, Fixed, Film, Chip, 50mW	2.50E-05	0.00125	1	0.1	0.2
M55342K02B1E50R	R6	1.50K, Fixed, Film, Chip, 50mW	2.50E-05	0.00125	1	0.1	0.2

Capacitors, Fixed, Ceramic

Part Number	Ref/Qty	Description	Failure Rate	λb	πCV	πQ	πE
M123A12BPB104KS	C1,C2	0.1pF, 50V	0.00016	0.00362	1.4547	0.03	0.5

Capacitors, Fixed, Electrolytic, Aluminum

Part Number	Ref/Qty	Description	Failure Rate	λb	πCV	πQ	πE
CWR06KC155JR	C3-C6	1.5uF, 50V	0.00137	0.01867	0.3657	0.1	0.5
CWR06KC685JR	C7-C9	6.8uF, 50V	0.00134	0.01867	0.4801	0.1	0.5

Interconnection Assemblies with PTHs

Part Number	Ref/Qty	Description	Failure Rate	λb	πC	πQ	πE	N1	N2
1348422-1	1	Printed Wiring Board	0.00238	1.7E-05	1.0059	1	0.5	0	20

Assembly Failure Rate: 0.04580

Part Number: 1348420

Regulator Circuit Card Assembly

TABLE A1RS-1 (Cont.)

Microcircuits, Gate/Logic Arrays and					Junct.		θjc		Mfr		
Part Number	Ref/Qty	Compl.	Tech.	Ea	Temp.	Watts	°C/W	Pins	Years	Package	Quality
M38510/11703BXC	U1	24	Linear	0.65	44.6	0.24	40	3	2	Can	S
M38510/11703BXC	U2	24	Linear	0.65	94.2	1.48	40	3	2	Can	S
M38510/11502BXC	U3	23	Linear	0.65	70	0.5	70	3	2	Can	S

Diodes, Low Frequency			Type/	Rated	Applied	Junct.	Actual	θjc	Rated		
Part Number	Ref/Qty	Contact	Appl	Voltage	Voltage	Temp.	Watts	°C/W	Power	Case	Quality
JANTXV1N3611	CR1-CR5	Metal	General	200	120	35	1E-06	70	2		JANTXV

Resistors, Fixed, Film		Rated	Actual	
Part Number	Ref/Qty	Power	Power	Quality
M55342K02B243DR	R1, R2	0.050	0.025	R
1348426	R3, R4	0.050	0.025	R
M55342K02B2E26R	R5	0.050	0.025	R
M55342K02B1E50R	R6	0.050	0.025	R

Capacitors, Fixed, Ceramic			Rated	Actual	Rated	
Part Number	Ref/Qty	pF	Volts	Volts	Temp	Quality
M123A12BPB104KS	C1,C2	100000	50	15	125	S

Capacitors, Fixed, Electrolytic, Alumi			Rated	Actual	Rated	
Part Number	Ref/Qty	uF	Volts	Volts	Temp	Quality
CWR06KC155JR	C3-C6	1.5	50	15	125	R
CWR06KC685JR	C7-C9	6.8	50	15	125	R

Interconnection Assemblies with PTH						
Part Number	Ref/Qty	Planes	Quality		Wave Solder	Hand Solder
1348422-1	1	2	Mil	PTHs->	0	20

TABLE A1RS-1 (Cont.)

Part Number	Description	Ref/Qty	Failure Rate	% Assembly
1348370-1	Cable Adapter	1		
1348436-1	Cable Assembly	1	0.00572	2.91
1348440-1	Loop Amplifier CCA	1	0.01158	5.89
1348520-1	PLL CCA	1	0.15113	76.86

			Failure Rate		
Part Number	Description	Ref/Qty	Total	Unit	% Assembly
M28861/06-002SB	Feedthru	6	0.00321	0.0005	1.63
4056-0000-00	Connector	1	0.02500	0.025	12.71

Assembly Failure Rate: 0.1966

TABLE A1RS-1 (Cont.)

Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Failure Rate	πT	πE	πQ	πL	C1	C2
INA-03170	U1,U2	Si Bipolar MMIC Amplifier	0.00488	0.41	0.50	0.25	2.0	0.010	0.0016

Diodes, Zeners

Part Number	Ref/Qty	Description	Failure Rate	λb	πT	πS	πC	πQ	πE
JANTXV1N752A	CR1-CR3	5.6V at 20mA	0.00261	0.0020	1.24	1.0	1.0	0.70	0.50

Diodes, High Frequency (Microwave Detector)

Part Number	Ref/Qty	Description	Failure Rate	λb	πT	πA	πR	πQ	πE
MSPD1012-E50	CR2	Sampling Phase Detector	0.00905	0.027	1.34	1.0	1.0	0.5	0.50

Transistors, High Frequency, Bipolar

Part Number	Ref/Qty	Description	Failure Rate	λb	πT	πR	πS	πQ	πE
AT-42010	Q4-Q6	Medium Power	0.10261	0.18	3.18	0.83	0.3	0.5	0.5

Transistors, Single Bipolar Si NPN

Part Number	Ref/Qty	Description	Failure Rate	λb	πT	πA	πR	πS	πQ	πE
JANTXV2N2222A	Q1-Q3		0.00039	0.00074	1.28	1.5	1.24	0.21	0.7	0.50

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Failure Rate	λb	πR	πQ	πE
M55342K02U1E21R	R1-R6	1.21K, Fixed Film, Chip, 50mW	0.00015	0.00125	1.0	0.1	0.20
M55342K02U121DR	R7,R8	121, Fixed, Film, Chip, 50mW	5.00E-05	0.00125	1.0	0.1	0.20
M55342K02U51D1R	R9,R10	51.1, Fixed, Film, Chip, 50mW	5.00E-05	0.00125	1.0	0.1	0.20
M55342K02U619DR	R11,R12	619, Fixed, Film, Chip, 50mW	5.00E-05	0.00125	1.0	0.1	0.20
M55342K02U10D0R	R13,R14	10.0, Fixed, Film, Chip, 50mW	5.00E-05	0.00125	1.0	0.1	0.20
M55342K02U475DR	R15,R16	475, Fixed, Film, Chip, 50mW	5.00E-05	0.00125	1.0	0.1	0.20
M55342K02U274DR	R17,R18	274, Fixed, Film, Chip, 50mW	5.00E-05	0.00125	1.0	0.1	0.20
M55342K02U24D3R	R19-R22	24.3, Fixed, Film, Chip, 50mW	0.00010	0.00125	1.0	0.1	0.20
M55342K02U200DR	R23,R24	200, Fixed, Film, Chip, 50mW	5.00E-05	0.00125	1.0	0.1	0.20
M55342K02U1E50R	R25-R27	1.50K, Fixed, Film, Chip, 50mW	7.50E-05	0.00125	1.0	0.1	0.20
CR05S/100	R28-R31	100 ohms, 50mW	0.00181	0.00905	1.0	0.1	0.50
M55342K02U1E00R	R32,R33	1.00K, Fixed, Film, Chip, 50mW	5.00E-05	0.00125	1.0	0.1	0.20

TABLE A1RS-1 (Cont.)

Capacitors, Fixed, Ceramic

Part Number	Ref/Qty	Description	Failure Rate	λb	πCV	πQ	πE
M123A10BPB102KS	C1-C14	1000pF, 50V	0.00067	0.00362	0.88	0.030	0.50
M123A10BPB104KS	C18-C20	0.1uF, 50V	0.00024	0.00362	1.45	0.030	0.50
D50BG101J1LA	C21-C24	100pF, 50V	0.00015	0.00362	0.68	0.030	0.50

Capacitors, Fixed, Ceramic, Chip

Part Number	Ref/Qty	Description	Failure Rate	λb	πCV	πQ	πE
CDR12BP100AJMR	C25	100pF, 50V	4.01E-05	0.00078	1.03	0.10	0.50

Capacitors, Electrolytic, Aluminum

Part Number	Ref/Qty	Description	Failure Rate	λb	πCV	πQ	πE
CWR06KA685JR	C15-C17	6.8uF, 50V	0.00134	0.01867	0.48	0.10	0.50

Coils

Part Number	Ref/Qty	Description	Failure Rate	λb	πC	πQ	πE
M83446/10-14	L1-L3	RF, Chip, Fixed, 0.120uH	0.00020	0.00044	1	0.3	0.50
1348506-1	L4-L7		0.00027	0.00044	1	0.3	0.50
LQN2AR12J04	L8		0.00020	0.00044	1	0.3	1.50

Interconnection Assemblies with PTHs

Part Number	Ref/Qty	Description	Failure Rate	λb	πC	πQ	πE	N1	N2
1348502-1	1	Printed Wiring Board	0.02381	1.7E-05	1.0	1	0.50	0	200

Filters

Part Number	Ref/Qty	Description	Failure Rate	λb	πCV	πQ	πE
M28861/6B-002SB	FL1-FL4	RFI Feed-Through Capacitor	0.00214	0.00118	0.9	1.0	0.50

Assembly Failure Rate: 0.15113

TABLE A1RS-1 (Cont.)

Microcircuits, Gate/Logic Arrays				Junct.	Actual	Rated	θjc		Years
Part Number	Ref/Qty	Compl	Ea	Temp.	Watts	Watts	°C/W	Pins	Mfrd
INA-03170	U1,U2	300	0.65	42.5	0.05	0.2	150	4	>2

Diodes, Zeners		Junct.	θjc	Actual	Rated	
Part Number	Ref/Qty	Temp.	°C/W	Watts	Power	Quality
JANTXV1N752A	CR1-CR3	35.42	70	0.006	0.4	JANTXV

Diodes, High Frequency (Microw			Junct.	θjc	Actual	Rated		
Part Number	Ref/Qty	Appl	Temp.	(°C/W)	Power	Power	Quality	Schottky
MSPD1012-E50	CR2	Other	37.94	70	0.042	1	JANTXV	Y

Transistors, High Frequency, Bip		Junct.	θjc	Actual	Rated	Freq.	Vce	Vceo	
Part Number	Ref/Qty	Temp.	°C/W	Watts	Power	(GHz)	Applied	Max	Case
AT-42010	Q4-Q6	83	150	0.32	0.6	0.573	7.2	12	

Transistors, Single Bipolar Si NP		Junct.	θjc	Actual	Rated	VCE	Vceo
Part Number	Ref/Qty	Temp.	°C/W	Watts	Power	Applied	Max
JANTXV2N2222A	Q1-Q3	35.7	70	0.01	1.8	1	2

Resistors, Fixed, Film		Rated	Actual	
Part Number	Ref/Qty	Power	Power	Quality
M55342K02U1E21R	R1-R6	0.050	0.025	R
M55342K02U121DR	R7,R8	0.050	0.025	R
M55342K02U51D1R	R9,R10	0.050	0.025	R
M55342K02U619DR	R11,R12	0.050	0.025	R
M55342K02U10D0R	R13,R14	0.050	0.025	R
M55342K02U475DR	R15,R16	0.050	0.025	R
M55342K02U274DR	R17,R18	0.050	0.025	R
M55342K02U24D3R	R19-R22	0.050	0.025	R
M55342K02U200DR	R23,R24	0.050	0.025	R
M55342K02U1E50R	R25-R27	0.050	0.025	R
CR05S/100	R28-R31	0.05	1E-06	R
M55342K02U1E00R	R32,R33	0.050	0.025	R

TABLE A1RS-1 (Cont.)

Capacitors, Fixed, Ceramic		Rated	Actual		Rated	
Part Number	Ref/Qty	Volts	Volts	pF	Temp	Quality
M123A10BPB102KS	C1-C14	50	15	1000	125	S
M123A10BPB104KS	C18-C20	50	15	100000	125	S
D50BG101J1LA	C21-C24	50	15	100	125	S

Capacitors, Fixed, Ceramic, Chip		Rated	Actual		
Part Number	Ref/Qty	Volts	Volts	pF	Quality
CDR12BP100AJMR	C25	50	15	100	R

Capacitors, Electrolytic, Aluminu		Rated	Actual		Rated
Part Number	Ref/Qty	Volts	Volts	uF	Temp
CWR06KA685JR	C15-C17	50	15	6.8	125

Coils				Power		
Part Number	Ref/Qty	Hot Spot	DT	Loss (W)	Type	Quality
M83446/10-14	L1-L3	30.21	0.19365	100.0E-6	Fixed	P
1348506-1	L4-L7	30.21	0.19365	100.0E-6	Fixed	P
LQN2AR12J04	L8	30.21	0.19365	100.0E-6	Fixed	P

Interconnection Assemblies with					
Part Number	Ref/Qty	Planes		Wave Solder	Hand Solder
1348502-1	1	2	PTHs->	0	200

Failure Rate Calculations for the PLO Power Relay

$\lambda p = \lambda b\ \pi C\ \pi L\ \pi CYC\ \pi F\ \pi Q\ \pi E$

λb =	0.0062	125°C rated at 40°C
πC =	5.5	(4PDT)
πL =	1.02	(Resistive load; S=10%)
πCYC =	0.1	(MIL SPEC, <1.0 cyc/hr)
πF =	6	(0-5A Contact Rating, Magnetic Latching)
πQ =	0.30	
πE =	0.5	

λp = 0.0062 (5.5) 1.02 (0.1) 6 (0.30) 0.5

λp = 0.00313

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Table A1ES METSAT Module A1
Electronic Subsystem

Nomenclature	Part Number	Quantity (n)	λ ($f/10^6$ hr)	nλ	λ Source/Remarks
Detector /Preamp Assembly	1331610-1	1	0.24994	0.24994	Table A1ES-EOS-1
Power Relay & Housekeeping Assy	1356969-1	1	0.08324	0.08324	Table A2ES-METSAT-1 equals P/N 1356908-1. Other misc. has no reliability impact.
DC-to-DC Converter Assy	1356010-1	1	0.38243	0.38243	AE-26577
Cables					
Spacecraft Power (W1)	1356428-2	1	0.04015	0.04015	Table A1ES-EOS-2
I/O Interface Power (W2)	1357146-1	1	0.08909	0.08909	Table A1ES-METSAT-1
Scan Drive (W3)	1356941-1	1	0.10757	0.10757	Table A1ES-METSAT-2
I/O Interface (W4)	1356942-1	1	0.19545	0.19545	Table A1ES-METSAT-3
I/O Temp (W5)	1356943-1	1	0.25041	0.25041	Table A1ES-METSAT-4
Signal Processing Assembly (1331670-7)					
Temp Sensor "A" CCA	1338421	1	0.03278	0.03278	Table A2ES-EOS-7
Temp Sensor "B" CCA (Not Mission Critical)	1331682-1	2	N/A		
Temp Sensor Analog MUX CCA	1331688	1	0.00914	0.00914	Table A2ES-EOS-8
Analog MUX and A/D Converter CCA	1356418	1	0.03684	0.03684	Table A2ES-EOS-9
Integrate and Dump Filter CCA	1338424	4	0.01269	0.05076	Table A2ES-EOS-10
Spacecraft Interface #1	1331144	1	0.08345	0.08345	Table A2ES-METSAT-7
Spacecraft Interface #2	1331147	1	0.05416	0.05416	Table A2ES-METSAT-8
Parallel to Serial Converter	1331150	1	0.06697	0.06697	Table A2ES-METSAT-9
Timing and Control CCA	1331135	1	0.02884	0.02884	Table A2ES-EOS-12
CPU CCA	1356413	1	0.02334	0.02334	Table A2ES-EOS-13
Memory CCA	1331126	1	0.01542	0.01542	Table A2ES-EOS-14
Scan Drive CCAs					
Scan Control Interface CCA	1331129	1	0.00731	0.00731	Table A2ES-EOS-15
Relay Driver and Current Monitor CCA	1356911-1	1	0.06183	0.06183	Table A2ES-METSAT-10
Interface/Converter CCA	1331697	2	0.03492	0.06984	Table A2ES-EOS-17
Resolver-Data Isolator CCA	1334972	2	0.01716	0.03432	Table A2ES-EOS-18
R-D Converter/Oscillator CCA	1337739	2	0.08332	0.16664	Table A2ES-EOS-19
Motor Driver CCA	1331694-1	2	0.03864	0.07728	Table A2ES-EOS-20

Total A1ES-METSAT λ = 2.2172

TABLE A1ES-METSAT-1

METSAT Part Number 1357146

Item No.	Qty Reqd	Part Number	Nomenclature	Designation	Pins/Connections
1	1	1337653-2	CCA, I/O Interfac	P326	60
2	1	311P409-4S-B-12	Connector, Sub-	P802	24
3	1	311P409-1S-B-12	Connector, Sub-	P706	36

Designation	λp	λb	πK	πP	πE	πQ	i_{AVG}	ΔT	AWG	
P326 Connector	0.00169	0.00057	1.0	11.89	0.50		0.1	0.01397	22	
Connections	0.078	0.0026			0.50	1.0				*Hand Solder, w/o Wrapping*
P802 Connector	0.00066	0.00057	1.0	4.62	0.50		0.1	0.01397	22	
Connections	0.00312	0.00026			0.50	1.0				*Crimp*
P706 Connector	0.00095	0.00057	1.0	6.66	0.50		0.1	0.01397	22	
Connections	0.00468	0.00026			0.50	1.0				*Crimp*
	0.08909									

TABLE A1ES-METSAT-2

METSAT Part Number 1356941-1

Item No.	Qty Reqd	Part Number	Nomenclature	Designation	Connections/Pins
1	1	1337653-3	CCA, I/O Interface	P327	52
2	1	1356784-1	Transistor Assy		58
3	1	311P409-3P-B-12	Connector, Sub-D	P702	30
4	1	311P409-3S-B-12	Connector, Sub-D	P101	19
	1	311P409-3S-B-12	Connector, Sub-D	P201	19
7	1	1337677-1	Connector, Recept, 92-pin	J403	18
	1	1337677-1	Connector, Recept, 92-pin	J404	18

Designation	λp	λb	πK	πP	πE	πQ	i_{AVG}	ΔT	AWG	
P327	0.00141	0.00057	1.0	9.95	0.50		0.1	0.01397	22	
	0.0676	0.0026			0.50	1.0				*Hand Solder, w/o Wrapping*
Transistor Assy	0.0180294	(see assembly 1356784 failure rate calculations)								
Connections	0.00406	0.00014			0.50	1.0				*Hand Solder, w/ Wrapping*
P702	0.00079	0.00057	1.0	5.60	0.50		0.1	0.01397	22	
	0.0039	0.00026			0.50	1.0				*Crimp*
P101	0.00055	0.00057	1.0	3.86	0.50		0.1	0.01397	22	
	0.00247	0.00026			0.50	1.0				*Crimp*
P201	0.00055	0.00057	1.0	3.86	0.50		0.1	0.01397	22	
	0.00247	0.00026			0.50	1.0				*Crimp*
J403	0.00053	0.00057	1.0	3.71	0.50		0.1	0.01397	22	
	0.00234	0.00026			0.50	1.0				
J404	0.00053	0.00057	1.0	3.71	0.50		0.1	0.01397	22	
	0.00234	0.00026			0.50	1.0				
	0.10757									

A1W3 Cable Assembly

TABLE A1ES-METSAT-2 (Cont)

Transistors, Low Frequency, Bipolar

Part Number	Ref/Qty	Description	Failure Rate	λb	πT	πA	πR	πS	πQ	πE
JANS2N3741	Q1-Q3	Power PNP	0.00249	0.00074	1.9133	0.7	3.2903	0.2120	2.4	0.5
JANS2N3749	Q4-Q6	Power NPN	0.00625	0.00074	4.4878	0.7	3.5199	0.2120	2.4	0.5
JANS2N3741	Q7-Q9 *(-1 only)*	Power PNP	0.00249	0.00074	1.9133	0.7	3.2903	0.2120	2.4	0.5
JANS2N3749	Q10-Q12 *(-1 only)*	Power NPN	0.00625	0.00074	4.4878	0.7	3.5199	0.2120	2.4	0.5

Diodes, Low Frequency

Part Number	Ref/Qty	Description	Failure Rate	λb	πT	πS	πC	πQ	πE
AS8301-1N5417-S	CR1-CR6	Fast Switching Rectifier	0.00028	0.001	1.40046	0.09525	1	0.7	0.5
AS8301-1N5417-S	CR7-CR12 *(-1 only)*	Fast Switching Rectifier	0.00028	0.001	1.40046	0.09525	1	0.7	0.5

-1 Failure Rate **0.01803**
-2 Failure Rate **0.00901**

Transistors, Low Frequency, Bipolar

Part Number	Ref/Qty	Description	*Junct. Temp.*	*Rated Power*	*Actual Power*	*Rated Vceo*	*VCE Applied*	*Appl. (Lin/Sw)*	*θjc (°C/W)*	*Case*	*Quality*
JANS2N3741	Q1-Q3	Power PNP	*55.0*	*25*	*2*	*80*	*40*	*Sw*	*10*	*TO-66*	*JAN*
JANS2N3749	Q4-Q6	Power NPN	*105.0*	*30*	*1*	*80*	*40*	*Sw*	*70*	*Stud*	*JAN*
JANS2N3741	Q7-Q9 *(-1 only)*	Power PNP	*55.0*	*25*	*2*	*80*	*40*	*Sw*	*10*	*TO-66*	*JAN*
JANS2N3749	Q10-Q12 *(-1 only)*	Power NPN	*105.0*	*30*	*1*	*80*	*40*	*Sw*	*70*	*Stud*	*JAN*

Diodes, Low Frequency

Part Number	Ref/Qty	Description			*Rated Voltage*	*Applied Voltage*	*Junct. Temp.*	*Actual Watts*	*θjc (°C/W)*	*Case*	*Quality*
AS8301-1N5417-S	CR1-CR6	Fast Switching Rectifier	*Contact*	*Type/App*							
AS8301-1N5417-S	CR7-CR12 *(-1 only)*	Fast Switching Rectifier	*Metal*	*Switch*	*100*	*38*	*35.00*	*0.0001*	*10*	*DO-41*	*JANTXV*
			Metal	*Switch*	*100*	*38*	*35.00*	*0.0001*	*10*	*DO-41*	*JANTXV*

METSAT Part Number 1356942

Item No.	Qty Reqd	Part Number	Nomenclature	Designation	Pins/Connections
1	1	1337653-3	CCA, I/O Interface	P301	65
2	1	AS8096-9SHRO	Connector, 9 Skt, HF Filter	J2	6
3	1	26139-1	Connector,	J3	3
4	1	AS8096-25PHRO	Connector, 25 Pin, HF Filter	J4	19
5	1	AS8096-15SHRO	Connector, 15 Skt, HF Filter	J5	12
7	1	AS8096-37SHRO	Connector, 37 Skt, HF Filter	J7	27

Designation	λp	λb	πK	πP	πE	πQ	i_{AVG}	ΔT	AWG	
P301 Connector	0.00187	0.00057	1.0	13.20	0.50		0.1	0.01397	22	
Connections	0.0845	0.0026			0.50	1.0				*Hand Solder, w/o Wrapping*
Shields	0.00007	0.00014			0.50	1.0				*Hand Solder, w/ Wrapping*
J2 Connector	0.00029	0.00057	1.0	2.02	0.50		0.1	0.01397	22	
Connections	0.0078	0.0026			0.50	1.0				*Hand Solder, w/o Wrapping*
Shields	0.00007	0.00014			0.50	1.0				*Hand Solder, w/ Wrapping*
Ground Lug	0.00026	0.00026			0.50	1.0				*Crimp*
J3 Connector	0.00022	0.00057	1.0	1.55	0.50		0.1	0.01397	22	
Connections	0.0039	0.0026			0.50	1.0				*Hand Solder, w/o Wrapping*
Shields	0.00007	0.00014			0.50	1.0				*Hand Solder, w/ Wrapping*
Ground Lug	0.00026	0.00026			0.50	1.0				*Crimp*
J4 Connector	0.00055	0.00057	1.0	3.86	0.50		0.1	0.01397	22	
Connections	0.0247	0.0026			0.50	1.0				*Hand Solder, w/o Wrapping*
Shields	0.00007	0.00014			0.50	1.0				*Hand Solder, w/ Wrapping*
Ground Lug	0.00026	0.00026			0.50	1.0				*Crimp*
J5 Connector	0.00041	0.00057	1.0	2.86	0.50		0.1	0.01397	22	
Connections	0.0156	0.0026			0.50	1.0				*Hand Solder, w/o Wrapping*
Shields	0.00007	0.00014			0.50	1.0				*Hand Solder, w/ Wrapping*
Ground Lug	0.00026	0.00026			0.50	1.0				*Crimp*
J7 Connector	0.00072	0.00057	1.0	5.10	0.50		0.1	0.01397	22	
Connections	0.0351	0.0026			0.50	1.0				*Hand Solder, w/o Wrapping*
Shields	0.00007	0.00014			0.50	1.0				*Hand Solder, w/ Wrapping*
Ground Lug	0.00026	0.00026			0.50	1.0				*Crimp*
	0.17738									

A1W4 Cable Assembly

TABLE A1ES-METSAT-4

METSAT Part Number 1356943

Item No.	Qty Reqd	Part Number	Nomenclature	Designation	Active Pins
1	1	1337653-4	CCA, I/O Interface	P302	88
2	1	AS8096-37PHR0	Connector, 37 Pin, HF Filter	J6	30
3	1	AS8381-03-F04N	Connector, 37 Pin, 26AWG Wire	P602	25
4	1	AS8381-03-A04N	Connector, 9 Pin, 26AWG Wire	P705	21
5	1	AS8381-03-G04N	Connector, 51 Pin, 26AWG Wire	P601	43
6	1	311P409-2S-B-12	Connector, Sub-D	J101	13
	1	311P409-2S-B-12	Connector, Sub-D	J202	13

Designation	λp	λb	πK	πP	πE	πQ	i_{AVG}	ΔT	AWG	
P302 Connector	0.00290	0.00057	1.0	20.46	0.50		0.1	0.01397	22	
Connections	0.1144	0.0026			0.50	1.0				*Hand Solder, w/o Wrapping*
J6 Connector	0.00079	0.00057	1.0	5.60	0.50		0.1	0.01397	22	
Connections	0.039	0.0026			0.50	1.0				*Hand Solder, w/o Wrapping*
Ground Lug	0.00026	0.00026			0.50	1.0				*Crimp*
P602 Connector	0.00068	0.00057	1.0	4.78	0.50		0.1	0.01397	22	
Connections	0.00325	0.00026			0.50	1.0				*Crimp*
P705 Connector	0.00059	0.00057	1.0	4.16	0.50		0.1	0.01397	22	
Connections	0.00273	0.00026			0.50	1.0				*Crimp*
P601 Connector	0.001135749	0.00057	1.0	8.01	0.50		0.1	0.01397	22	
Connections	0.00559	0.00026			0.50	1.0				*Crimp*
P102 Connector	0.001135749	0.00057	1.0	3.00	0.50		0.1	0.01397	22	
Connections	0.00169	0.00026			0.50	1.0				*Crimp*
P202 Connector	0.001135749	0.00057	1.0	3.00	0.50		0.1	0.01397	22	
Connections	0.00169	0.00026			0.50	1.0				*Crimp*
	0.17698									

A1W5 Cable Assembly

Table A1ES-EOS Module A1
Electronic Subsystem

Nomenclature	Part Number	Quantity (n)	λ ($f/10^6$ hr)	nλ	λ Source/Remarks
Detector /Preamp Assembly	1331610-1	1	0.24994	0.24994	Table A1ES-EOS-1
Power Control/Monitoring Assy	1356760-1	1	0.28827	0.28827	Table A2ES-EOS-2
DC-to-DC Converter	1356010-1	1	0.38243	0.38243	AE-26577
Cables					
Spacecraft Power (W1)	1356428-1	1	0.04015	0.04015	Table A1ES-EOS-2
Power In (W2)	1356427-1	1	0.08909	0.08909	Table A1ES-EOS-3
Scan Drive (W3)	1356424-1	1	0.11464	0.11464	Table A1ES-EOS-4
Clock and PRT (W4)	1356425-1	1	0.09264	0.09264	Table A1ES-EOS-5
Warm Load (W5)	1356426-1	1	0.24649	0.24649	Table A1ES-EOS-6
Signal Processing Assembly (1356412-1)					
Temp Sensor "A" CCA	1338421	1	0.03278	0.03278	Table A2ES-EOS-7
Temp Sensor "B" CCA (Not Mission Critical)	1331682	2	N/A		
Temp Sensor Analog MUX CCA	1331688	1	0.00914	0.00914	Table A2ES-EOS-8
Analog MUX and A/D Converter CCA	1356418	1	0.03684	0.03684	Table A2ES-EOS-9
Integrate and Dump Filter CCA	1338424	4	0.01269	0.05076	Table A2ES-EOS-10
MIL-STD-1553 Interface CCA	1355998	1	0.15342	0.15342	Table A2ES-EOS-11
Timing and Control CCA	1331135	1	0.02884	0.02884	Table A2ES-EOS-12
CPU CCA	1356413	1	0.02334	0.02334	Table A2ES-EOS-13
Memory CCA	1331126	1	0.01542	0.01542	Table A2ES-EOS-14
Scan Drive CCAs					
Scan Control Interface CCA	1331129	1	0.00731	0.00731	Table A2ES-EOS-15
MUX Relay CCA	1356000	1	0.02586	0.02586	Table A2ES-EOS-16
Interface/Converter CCA	1331697	2	0.03492	0.06984	Table A2ES-EOS-17
Resolver-Data Isolator CCA	1334972	2	0.01716	0.03432	Table A2ES-EOS-18
R-D Converter/Oscillator CCA	1337739	2	0.08332	0.16664	Table A2ES-EOS-19
Motor Driver CCA	1331694	2	0.03864	0.07728	Table A2ES-EOS-20

Total A1ES-EOS-2 = 2.2354

TABLE A1ES-EOS-1

Environment: SF

Temperature: 30°C

Part Number	Description	Ref/Qty	Failure Rate Unit	Failure Rate Total
1331074-1	CCA, 2-Channel Video Preamp	1	0.0116	0.0116
1331074-2	CCA, 2-Channel Video Preamp	1	0.0116	0.0116
1331157	CCA, 3-Channel Video Preamp	3	0.0145	0.0436
1331577-1	Detector, RF	12	0.0141	0.1690
1331577-2	Detector, RF	1	0.0176	0.0176
AS8052-1	Connector	2	0.008	0.016
AS8385-55-3007	SMA Connectors	13	0.003	0.039
AS8137-2A204	Connector	2	0.008	0.016
311P10-2P-C-15	Connecor	2	0.008	0.016

A1 Module: 0.25350

Part Number: 1331610

Detector / Preamp Assembly

TABLE A1ES-EOS-1 (Cont.)

Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Failure Rate	ΠT	ΠE	ΠQ	ΠL	C1	C2
23149-4	U1	Positive Regulator (LM140H-12)	0.00060	0.22752	0.50	0.25	1.0	0.01	0.0003
23149-5	U2	Negative Regulator (LM120H-12)	0.00060	0.22751	0.50	0.25	1.0	0.01	0.0003
23149-3	U3	Reference Diode (LM136A)	0.00058	0.22761	0.50	0.25	1.0	0.01	0.0001
25012/15-1	U4, U5	Operational Amplifier (LT1007A)	0.00163	0.22763	0.50	0.25	1.0	0.01	0.0020
M38510/10104SGX	U7, U8	Operational Amplifier (LM108A)	0.00151	0.22751	0.50	0.25	1.0	0.01	0.0015

Diodes, Low Frequency

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠT	ΠS	ΠC	ΠQ	ΠE
JANS1N5615	CR1	Diode	0.00010	0.0038	1.4	0.054	1	0.7	0.5

Resistors, Fixed, Composition

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠR	ΠQ	ΠE
RCR05G103JS	R1	10K, 5%, 0.125W, Est. Rel.	7.50E-06	0.00125	1	0.03	0.2
RCR05G101JS	R14-R17	100, 5%, 0.125W, Est. Rel.	3.00E-05	0.00125	1	0.03	0.2
1331073-5 (All)	R8, R10	Resistor Kit	9.03E-06	0.00075	1	0.03	0.2
1331073-4 (All)	R20, R22	Resistor Kit	9.03E-06	0.00075	1	0.03	0.2
1331073-9 (-1)	R9, R11	Resistor Kit	9.03E-06	0.00075	1	0.03	0.2
1331073-6 (-1, -3)	R21, R23	Resistor Kit	9.03E-06	0.00075	1	0.03	0.2
1331073-10 (-2)	R9	Resistor Kit	4.52E-06	0.00075	1	0.03	0.2
1331073-9 (-2)	R11	Resistor Kit	4.52E-06	0.00075	1	0.03	0.2
1331073-7 (-2)	R21	Resistor Kit	4.52E-06	0.00075	1	0.03	0.2
1331073-6 (-2)	R22	Resistor Kit	4.52E-06	0.00075	1	0.03	0.2
1331073-6 (-3)	R9, R11	Resistor Kit	9.03E-06	0.00075	1	0.03	0.2

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠR	ΠQ	ΠE
RNC05J1002FS	R2, R3	10K, 1%, 0.1W, Est. Rel.	8.14E-06	0.00068	1	0.03	0.2
RNC05J4991FS	R5, R6	4.99K, 1%, 0.1W, Est. Rel.	8.14E-06	0.00068	1	0.03	0.2

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠCV	ΠQ	ΠE
M39014/01-1348	C2-C7	Capacitor, Ceramic, ER, 330pF, 200V	3.91E-05	0.0007	0.776	0.03	0.4
M39014/01-1339	C8	Capacitor, Ceramic, ER, 100pF, 200V	5.71E-06	0.0007	0.68	0.03	0.4
M39014/02-1350	C9, C10	Capacitor, Ceramic, ER, 0.1uF, 100V	2.45E-05	0.0007	1.455	0.03	0.4

TABLE A1ES-EOS-1 (Cont.)

Capacitors, Fixed, Electrolytic, Tantalum, Solid

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠCV	ΠSR	ΠQ	ΠE
M39003/01-8194	C1	Capacitor, Solid Tant., ER, 1uF, 50V	1.89E-05	0.00476	1	0.33	0.03	0.4

Connector, PCB	Ref/Qty	Description	Failure Rate	λb	ΠK	ΠP	ΠE
AS8137-1A20Y-0	P1	Connector	0.00099	0.00028	1.5	4.619	0.5

Interconnection Assemblies with PTHs

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠC	ΠQ	ΠE	N1	N2
1337285-1	1	Printed Wiring Board	0.00321	1.7E-05	1.792	1	0.5	211	0

Connections	Ref/Qty	Description	Failure Rate	λb	ΠQ	ΠE
Hand Solder, with Wrapping	32	Select-At-Test Resistors	0.00224	0.00014	1	0.5

Total Failure Rate (-1): 0.01163
(-2): 0.01163
(-3): 0.01166

TABLE A1ES-EOS-1 (Cont.)

Microcircuits, Gate/Logic Arrays and Part Number	Ref/Qty	Compl.	Tech.	Ea	Junct. Temp.	Watts	θjc (°C/W)	Pins	Mfr Years	Package	Quality
23149-4	U1	11	Linear	0.65	35.00	0.0001	26	3	>2	Can	S
23149-5	U2	22	Linear	0.65	35.00	0.0001	21	3	>2	Can	S
23149-3	U3	17	Linear	0.65	35.01	0.0001	80	2	>2	Can	S
25012/15-1	U4, U5	30	Linear	0.65	35.01	0.0002	45	8	>2	Can	S
M38510/10104SGX	U7, U8	29	Linear	0.65	35.00	0.00005	45	7	>2	Can	S

Diodes, Low Frequency Part Number	Ref/Qty	Rated Voltage	Actual Voltage	θjc (°C/W)	Junct. Temp.	Rated Power	Actual Power	Case	Quality
JANS1N5615	CR1	75	5	10	35.00	0.383	1.0E-6	DO-3	JANTXV

Resistors, Fixed, Composition Part Number	Ref/Qty	Ohms	Rated Power	Actual Power	Quality
RCR05G103JS	R1	10000	0.125	0.0625	S
RCR05G101JS	R14-R17	100	0.125	0.0625	S
1331073-5 (All)	R8, R10	10000	0.125	0.0053	S
1331073-4 (All)	R20, R22	10000	0.125	0.0053	S
1331073-9 (-1)	R9, R11	10000	0.125	0.0053	S
1331073-6 (-1, -3)	R21, R23	10000	0.125	0.0053	S
1331073-10 (-2)	R9	10000	0.125	0.0053	S
1331073-9 (-2)	R11	10000	0.125	0.0053	S
1331073-7 (-2)	R21	10000	0.125	0.0053	S
1331073-6 (-2)	R22	10000	0.125	0.0053	S
1331073-6 (-3)	R9, R11	10000	0.125	0.0053	S

Resistors, Fixed, Film Part Number	Ref/Qty	Ohms	Rated Power	Actual Power	Quality
RNC05J1002FS	R2, R3	10000	0.125	0.0053	S
RNC05J4991FS	R5, R6	4990	0.125	0.0053	S

Capacitors, Fixed, Ceramic, General Part Number	Ref/Qty	pF	Rated Temp.	Rated Voltage	Actual Voltage	Quality
M39014/01-1348	C2-C7	330	85	200	5	S
M39014/01-1339	C8	100	85	200	5	S
M39014/02-1350	C9, C10	100000	85	100	5	S

TABLE A1ES-EOS-1 (Cont.)

Capacitors, Fixed, Electrolytic, Tanta			Rated	Rated	Actual	
Part Number	Ref/Qty	uF	Temp.	Voltage	Voltage	Quality
M39003/01-8194	C1	1	85	50	5	S

		Active	Pin	Avg.	Temp.		Mate / Unmate
Connector, PCB	Ref/Qty	Pins	Gauge	Current	Rise	Quality	per 1000 hours
AS8137-1A20Y-0	P1	24	26	0.1	0.03	Mil	0.5

Interconnection Assemblies with PT						
Part Number	Ref/Qty	Layers	Quality		Wave Solder	Hand Solder
1337285-1	1	5	Mil	PTHs->	211	0

Connections	Ref/Qty
Hand Solder, with Wrapping	32

TABLE A1ES-EOS-1 (Cont.)

Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Failure Rate	ΠT	ΠE	ΠQ	ΠL	C1	C2
23149-4	U1	Positive Regulator (LM140H-12)	0.00089	0.3416	0.50	0.25	1.0	0.01	0.0003
23149-5	U2	Negative Regulator (LM120H-12)	0.00082	0.31624	0.50	0.25	1.0	0.01	0.0003
23149-3	U3	Reference Diode (LM136A)	0.00059	0.23111	0.50	0.25	1.0	0.01	0.0001
M38510/10104SGX	U4-U6	Operational Amplifier (LM108A)	0.00232	0.23407	0.50	0.25	1.0	0.01	0.0015
25012/15-1	U7-U9	Operational Amplifier (LT1007A)	0.00315	0.32141	0.50	0.25	1.0	0.01	0.0020

Diodes, Low Frequency

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠT	ΠS	ΠC	ΠQ	ΠE
JANS1N5615	CR1, CR2	Rectifier, Power	3.65E-05	0.069	1.4	0.054	1	0.7	0.5

Resistors, Fixed, Composition

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠR	ΠQ	ΠE
RCR05G103JS	R1	Resistor, Film, ER, 10K, 0.125W	4.79E-06	7.99E-04	1	0.03	0.2
RCR05G101JS	R14-R19	Resistor, Film, ER, 100, 0.125W	2.60E-05	7.22E-04	1	0.03	0.2

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠR	ΠQ	ΠE
RNC05D1002FS	R2-R4	Resistor, Fixed, Film, ER, 10K, 0.1W	1.30E-05	0.00072	1	0.03	0.2
RNC05D4991FS	R5-R7	Resistor, Fixed, Film, ER, 4.99K, 0.1W	1.17E-05	0.00065	1	0.03	0.2
RNC05D4991FS	R8, R10, R12	Resistor, Fixed, Film, ER, 4.99K, 0.1W	1.17E-05	0.00065	1	0.03	0.2
RNC05D4991FS	R9, R11, R13	Resistor, Fixed, Film, ER, 4.99K, 0.1W	1.17E-05	0.00065	1	0.03	0.2
RNC05D4991FS	R20, R22, R24	Resistor, Fixed, Film, ER, 4.99K, 0.1W	1.17E-05	0.00065	1	0.03	0.2
RNC05D4991FS	R21, R23. R25	Resistor, Fixed, Film, ER, 4.99K, 0.1W	1.17E-05	0.00065	1	0.03	0.2

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠCV	ΠQ	ΠE
M39014/01-1348	C7-C9	Capacitor, Ceramic, ER, 330pF, 200V	1.86E-05	0.00067	0.776	0.03	0.4
M39014/02-1350	C10-C15	Capacitor, Ceramic, ER, 0.1uF, 100V	7.16E-05	0.00068	1.455	0.03	0.4
M39014/01-1339	C16-C18	Capacitor, Ceramic, ER, 100pF, 200V	1.67E-05	0.00068	0.68	0.03	0.4

Capacitors, Fixed, Electrolytic, Tantalum, Solid

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠCV	ΠSR	ΠQ	ΠE
M39003/01-8194	C1, C2	Est. Rel., 1uF, 50V	0.00013	0.00667	1	0.33	0.03	0.4
M39003/01-8194	C3-C6	Est. Rel., 1uF, 50V	0.00023	0.0057	1	0.33	0.03	0.4

TABLE A1ES-EOS-1 (Cont.)

Connector, PCB	Qty/Ref	Description	Failure Rate	λb	ΠK	ΠP	ΠE
1337748-1	P1	Connector, Receptacle, 92-Contact	0.00243	0.00028	1.5	11.38	0.5

Interconnection Assemblies with PTHs

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠC	ΠQ	ΠE	N1	N2
1337285-1	1	Printed Wiring Board	0.00372	1.7E-05	1.792	1	0.5	244	0

Total Failure Rate: 0.01452

TABLE A1ES-EOS-1 (Cont.)

Microcircuits, Gate/Logic Arrays an					Junct.		θjc		Mfr		
Part Number	Ref/Qty	Compl.	Tech.	Ea	Temp.	Watts	(°C/W)	Pins	Years	Package	Quality
23149-4	U1	11	Linear	0.65	40.2	0.2	26	3	>2	Can	S
23149-5	U2	22	Linear	0.65	39.2	0.2	21	3	>2	Can	S
23149-3	U3	17	Linear	0.65	35.2	0.0025	80	2	>2	Can	S
M38510/10104SGX	U4-U6	29	Linear	0.65	35.4	0.008	45	7	>2	Can	S
25012/15-1	U7-U9	30	Linear	0.65	39.4	0.098	45	8	>2	Can	S

Diodes, Low Frequency		Rated	Actual	θjc	Junct.	Rated	Actual	
Part Number	Ref/Qty	Voltage	Voltage	(°C/W)	Temp.	Power	Power	Quality
JANS1N5615	CR1, CR2	25	5.1	38	35.00	25	1.00E-06	JANTXV

Resistors, Fixed, Composition			Rated	Actual	
Part Number	Ref/Qty	Ohms	Power	Power	Quality
RCR05G103JS	R1	10000	0.125	0.012	S
RCR05G101JS	R14-R19	100	0.125	0.00064	S

Resistors, Fixed, Film			Rated	Actual	
Part Number	Ref/Qty	Ohms	Power	Power	Quality
RNC05D1002FS	R2-R4	10000	0.125	0.012	S
RNC05D4991FS	R5-R7	4990	0.125	1.0E-6	S
RNC05D4991FS	R8, R10, R12	4990	0.125	1.0E-6	S
RNC05D4991FS	R9, R11, R13	4990	0.125	1.0E-6	S
RNC05D4991FS	R20, R22, R24	4990	0.125	0.0004	S
RNC05D4991FS	R21, R23. R25	4990	0.125	0.0004	S

Capacitors, Fixed, Ceramic, General			Rated	Rated	Actual	
Part Number	Ref/Qty	pF	Temp.	Voltage	Voltage	Quality
M39014/01-1348	C7-C9	330	125	50	5	S
M39014/02-1350	C10-C15	100000	125	100	12	S
M39014/01-1339	C16-C18	100	125	100	12	S

Capacitors, Fixed, Electrolytic, Tant			Rated	Rated	Actual	
Part Number	Ref/Qty	uF	Temp.	Voltage	Voltage	Quality
M39003/01-8194	C1, C2	1	85	50	15	S
M39003/01-8194	C3-C6	1	85	50	12	S

TABLE A1ES-EOS-1 (Cont.)

Connector, PCB	Qty/Ref	Active Pins	Pin Gauge	Avg. Current	Temp. Rise	Quality	Mate / Unmate per 1000 hours
1337748-1	P1	58	26	0.1	0.03	Mil	0.5

Interconnection Assemblies with PT Hs

Part Number	Ref/Qty	Layers	Quality		Wave Solder	Hand Solder
1337285-1	1	5	Mil	PTHs->	244	0

TABLE A1ES-EOS-1 (Cont.)

RF Detector Failure Rate Prediction

Using the hybrid failure model:

$$\lambda_P = [\Sigma N_C \lambda_C] (1 + 0.2\pi_E) \pi_F \pi_Q \pi_L + 2\lambda_{Conn}$$

λ_P = Total hybrid failure rate
N_C = Number of each particular component
λ_C = Failure rate for each particular component
π_E = Environment factor
π_F = Circuit function factor
π_Q = Quality factor
π_L = Learning factor
λ_{Conn} = Failure rate for the connectors

λ_{Diode} = 0.00259
$\lambda_{Resistor}$ = 0.00080
$\lambda_{Capacitor}$ = 0.00086
$\lambda_{Interconn}$ = 0.00055
λ_{Conn} = 0.00270
π_E = 0.5 S_F
π_{F-1} = 1.2 10MHz < f < 1GHz
π_{F-2} = 2.6 f > 1GHz
π_Q = 0.25 Procured to Class S requirements
π_L = 1.0 ≥2 year in production.

$$\lambda_P = [\Sigma N_C \lambda_C] (1 + 0.2\pi_E) \pi_F \pi_Q \pi_L + 2\lambda_{Conn}$$

$\lambda_{P(-1)}$ = 0.00698 Failures / 10^6 Hours for Part Number 1331577-1 0.9997

$\lambda_{P(-2)}$ = 0.00883 Failures / 10^6 Hours for Part Number 1331577-2 0.9996

TABLE A1ES-EOS-1 (Cont.)

I. For the Tunnel Diode:

The part operating failure rate model (λ_P), from section 6.2 is:

$$\lambda_P = \lambda_b \pi_T \pi_A \pi_C \pi_Q \pi_E$$

λ_b = Base Failure Rate
= 0.0023 failures/10^6 hours

π_T = Temperature Factor

$$= \exp\left[-2100\left(\frac{1}{T_J + 273} - \frac{1}{298}\right)\right]$$

where: T_J = Junction Temp. = 30.03 °C

π_T = 1.1

π_A = Application Factor	= 1.0	"All Other Diodes"
π_R = Power Rating Factor	= 1.0	"All Other Diodes"
π_Q = Quality Factor	= 1	per Section 5.5
π_E = Environment Factor	= 1	per Section 5.5

λ_P = 0.00259 Failures/10^6 Hours

TABLE A1ES-EOS-1 (Cont.)

II. For the Chip Resistor:

The general model for a hybrid states that chip resistors are considered to contribute insignificantly to the overall hybrid failure rate, and are assumed to have a failure rate of zero. However, since this hybrid consists of a capacitor, a diode and a resistor, the hybrid is considered to consist of mostly passive components and the failure rate for the resistor is derived here.

The part operating failure rate model (λ_P), from section 9.2 is:

$$\lambda_P = \lambda_b \pi_R \pi_Q \pi_E$$

λ_b = Base Failure Rate

$$= 5x10^{-3} \exp\left[3.5\left(\frac{T+273}{398}\right)\right] \exp\left[S\left(\frac{T+273}{273}\right)\right]$$

where: S = Power Stress Ratio = 0.1
T = Operating Temp. = 30 °C

λ_b = 0.00080 failures/10^6 hours

π_R = Resistance Factor	=	1.0	assumed to be less than 100KΩ
π_Q = Quality Factor	=	1	per Section 5.5
π_E = Environment Factor		1	per Section 5.5

λ_P = 0.00080 Failures/10^6 Hours

TABLE A1ES-EOS-1 (Cont.)

III. For the Capacitor:

Using a CKR style capacitor as stated in the Advanced Control Components, Inc. Reliability Prediction RP-1335923. Which is a similar design used on SSMIS.

The part operating failure rate model (λ_P), from section 10.10 is:

$\lambda_P = \lambda_b \pi_{CV} \pi_Q \pi_E$

λ_b = Base Failure Rate

$$= 0.0003\left[\left(\frac{S}{0.3}\right)^3 + 1\right]\exp\left(\frac{T + 273}{T_{max} + 273}\right)$$

where: S = Voltage Stress = 0.1
T = Operating Temp. = 30 °C
T_{max} = Rated Temp. = 150 °C

λ_b = 0.00064 failures/10^6 hours

π_{CV} = Capacitance Factor

$= 0.59C^{0.12}$ C = Capacitance in picofarads = 1000

π_{CV} = 1.35

π_Q = Quality Factor = 1 per Section 5.5

π_E = Environment Factor 1 per Section 5.5

λ_P = 0.00086 Failures/10^6 Hours

TABLE A1ES-EOS-1 (Cont.)

IV. For the Interconnections:

The part operating failure rate model (λ_P), from section 17.1 is:

$\lambda_P = \lambda_b \pi_Q \pi_E$

λ_b = Base Failure Rate

λ_b =	0.000069 failures/10^6 hours	Hand solder, w/o Wrapping
π_Q = Quality Factor	= 1	per Section 5.5
π_E = Environment Factor	1	per Section 5.5

λ_P = 0.000069 Failures/10^6 Hours

N = 8

$N\lambda_P$ = 0.000552 Failures/10^6 Hours

TABLE A1ES-EOS-1 (Cont.)

V. For the Connectors:

The part operating failure rate model (λ_P), from section 15.1 is:

$\lambda_P = \lambda_b \pi_K \pi_P \pi_E$

λ_b = Base Failure Rate (for insert material C)

$$= 0.190 \exp\left[\left(\frac{-1298.0}{T_O + 273}\right) + \left(\frac{T_O + 273}{373}\right)^{4.25}\right]$$

where: T_O =Int. Contact Temp. = 30 °C Insignificant temperature rise

λ_b = 0.0040 failures/10^6 hours

π_K = Mate/Unmate Factor = 1.0 less than 0.05 per 1000 hours

π_P = Active Pins Factor 2 Active Pins per Section 15.1

$$= \exp\left[\left(\frac{N-1}{10}\right)^{0.51064}\right]$$

π_P = 1.36

π_E = Environment Factor 0.50 per Section 5.5

λ_P = 0.00270 Failures/10^6 Hours

TABLE A1ES-EOS-1 (Cont.)

Estimated Active Device Junction Temperature (T_J)

$T_J = T_C + \Theta_{JC}P_D$

where:

T_C = Case Temperature

Θ_{JC} = Junction-to-Case Thermal Resistance

$$\Theta_{JC} = \frac{\sum_{i=1}^{n}\left(\frac{1}{K_i}\right)L_i}{A}$$

Layer	Figure 1 Feature	$1/K_i(L_i)$ (in² °C/W)	
Germanium Chip	A	0.0045	estimate
Conductive Epoxy	B	0.023	
Solder Substrate Attachment	E	0.0023	
	$\Sigma(1/K_i)L_i$ =	0.0298	

A = Die Area

= [0.00278 (No. Die Active Wire Terminals) + 0.0417]²

A = 0.0022 in²

Θ_{JC} = 13.3 °C/W

P_D = Power Dissipation

P_D = 0.002 watts

$T_J = T_C + \Theta_{JC}P_D$

T_J = 30.03 °C

TABLE A1ES-EOS-2

Part Number 1356428-1 and -2

Item No.	Qty Reqd	Part Number	Nomenclature	Designation	Pins/Connections
1	1	AS8096-25PLR0	Connector, 25 Pin, LF Filter	J1	25
2	1	311P409-4S-B-12	Connector, Sub-D	P701	28
3	1	311P409-1S-B-12	Connector, Sub-D	P801	5

Designation	λp	λb	πK	πP	πE	πQ	i_{AVG}	ΔT	Pin AWG	
J1 Connector	0.00068	0.00057	1.0	4.78	0.50		0.1	0.0140	22	*B Insert*
Connections	0.0312	0.0026			0.50	1.0				*Hand Solder, w/o Wrapping*
Shield Connections	0.00077	0.00014			0.50	1.0				*Hand Solder, w/Wrapping*
Ground Lug	0.00143	0.00026			0.50	1.0				*Crimped*
P701 Connector	0.00075	0.00057	1.0	5.26	0.50		0.1	0.0140	22	
Connections	0.00364	0.00026			0.50	1.0				*Crimped*
P801 Connector	0.00027	0.00057	1.0	1.87	0.50		0.1	0.0140	22	
Connections	0.00065	0.00026			0.50	1.0				*Crimped*
Shield Connections	0.00077	0.00014			0.50	1.0				*Hand Solder, w/Wrapping*
	0.04015									

TABLE A1ES-EOS-3

EOS Part Number 1356427-1

Item No.	Qty Reqd	Part Number	Nomenclature	Designation	Pins/Connections
1	1	1337653-2	CCA, I/O Interfac	P326	60
2	1	311P409-4S-B-12	Connector, Sub-	P802	24
3	1	311P409-1S-B-12	Connector, Sub-	P706	36

Designation	λp	λb	πK	πP	πE	πQ	i_{AVG}	ΔT	AWG	
P326 Connector	0.00169	0.00057	1.0	11.89	0.50		0.1	0.01397	22	
Connections	0.078	0.0026			0.50	1.0				*Hand Solder, w/o Wrapping*
P802 Connector	0.00066	0.00057	1.0	4.62	0.50		0.1	0.01397	22	
Connections	0.00312	0.00026			0.50	1.0				*Crimp*
P706 Connector	0.00095	0.00057	1.0	6.66	0.50		0.1	0.01397	22	
Connections	0.00468	0.00026			0.50	1.0				*Crimp*
	0.08909									

TABLE A1ES-EOS-4

EOS Part Number 1356424-1

Item No.	Qty Reqd	Part Number	Nomenclature	Designation	Connections/Pins
1	1	1337653-3	CCA, I/O Interface	P327	64
2	1	1356784-1	Transistor Assy		58
3	1	311P409-3P-B-12	Connector, Sub-D	P702	24
4	1	311P409-3S-B-12	Connector, Sub-D	P101	20
	1	311P409-3S-B-12	Connector, Sub-D	P201	20

Designation	λp	λb	πK	πP	πE	πQ	i_{AVG}	ΔT	AWG	
P327	0.00184	0.00057	1.0	12.93	0.50		0.1	0.01397	22	
	0.0832	0.0026			0.50	1.0				*Hand Solder, w/o Wrapping*
Transistor Assy	0.0180294	(see assembly 1356784 failure rate calculations)								
Connections	0.00406	0.00014			0.50	1.0				*Hand Solder, w/ Wrapping*
P702	0.00066	0.00057	1.0	4.62	0.50		0.1	0.01397	22	
	0.00312	0.00026			0.50	1.0				*Crimp*
J101	0.00057	0.00057	1.0	4.01	0.50		0.1	0.01397	22	
	0.0026	0.00026			0.50	1.0				*Crimp*
J201	0.00057	0.00057	1.0	4.01	0.50		0.1	0.01397	22	
	0.0026	0.00026			0.50	1.0				*Crimp*
	0.11464									

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TABLE A1ES-EOS-4 (Cont)

Transistors, Low Frequency, Bipolar

Part Number	Ref/Qty	Description	Failure Rate	λb	πT	πA	πR	πS	πQ	πE
JANS2N3741	Q1-Q3	Power PNP	0.00249	0.00074	1.9133	0.7	3.2903	0.2120	2.4	0.5
JANS2N3749	Q4-Q6	Power NPN	0.00625	0.00074	4.4878	0.7	3.5199	0.2120	2.4	0.5
JANS2N3741	Q7-Q9 *(-1 only)*	Power PNP	0.00249	0.00074	1.9133	0.7	3.2903	0.2120	2.4	0.5
JANS2N3749	Q10-Q12 *(-1 only)*	Power NPN	0.00625	0.00074	4.4878	0.7	3.5199	0.2120	2.4	0.5

Diodes, Low Frequency

Part Number	Ref/Qty	Description	Failure Rate	λb	πT	πS	πC	πQ	πE
AS8301-1N5417-S	CR1-CR6	Fast Switching Rectifier	0.00028	0.001	1.40046	0.09525	1	0.7	0.5
AS8301-1N5417-S	CR7-CR12 *(-1 only)*	Fast Switching Rectifier	0.00028	0.001	1.40046	0.09525	1	0.7	0.5

-1 Failure Rate **0.01803**
-2 Failure Rate **0.00901**

Transistors, Low Frequency, Bipolar

Part Number	Ref/Qty	Description	*Junct.*	*Rated*	*Actual*	*Rated*	*VCE*	*Appl.*	*θjc*		
JANS2N3741	Q1-Q3	Power PNP	*Temp.*	*Power*	*Power*	*Vceo*	*Applied*	*(Lin/Sw)*	*(°C/W)*	*Case*	*Quality*
JANS2N3749	Q4-Q6	Power NPN	*55.0*	*25*	*2*	*80*	*40*	*Sw*	*10*	*TO-66*	*JAN*
JANS2N3741	Q7-Q9 *(-1 only)*	Power PNP	*105.0*	*30*	*1*	*80*	*40*	*Sw*	*70*	*Stud*	*JAN*
JANS2N3749	Q10-Q12 *(-1 only)*	Power NPN	*55.0*	*25*	*2*	*80*	*40*	*Sw*	*10*	*TO-66*	*JAN*
			105.0	*30*	*1*	*80*	*40*	*Sw*	*70*	*Stud*	*JAN*

Diodes, Low Frequency

Part Number	Ref/Qty	Description			*Rated*	*Applied*	*Junct.*	*Actual*	*θjc*		
AS8301-1N5417-S	CR1-CR6	Fast Switching Rectifier	*Contact*	*Type/App*	*Voltage*	*Voltage*	*Temp.*	*Watts*	*(°C/W)*	*Case*	*Quality*
AS8301-1N5417-S	CR7-CR12 *(-1 only)*	Fast Switching Rectifier	*Metal*	*Switch*	*100*	*38*	*35.00*	*0.0001*	*10*	*DO-41*	*JANTXV*
			Metal	*Switch*	*100*	*38*	*35.00*	*0.0001*	*10*	*DO-41*	*JANTXV*

TABLE A1ES-EOS-5

EOS Part Number 1356425-1

Item No.	Qty Reqd	Part Number	Nomenclature	Designation	Pins/Connections
1	1	1337653-3	CCA, I/O Interface	P301	34
2	1	AS8096-9SHR0	Connector, 9 Skt, HF Filter	J3	6
3	1	AS8096-9PHR0	Connector, 9 Pin, HF Filter	J5	7
4	1	AS8096-37SHR0	Connector, 37 Skt, HF Filter	J4	22
7	4	RCR42G560JS	Resistor, 56Ω, (R-39008)	R1-R4	8

Designation	λp	λb	πK	πP	πE	πQ	i_{AVG}	ΔT	AWG	
P301 Connector	0.00089	0.00057	1.0	6.30	0.50		0.1	0.01397	22	
Connections	0.0442	0.0026			0.50	1.0				*Hand Solder, w/o Wrapping*
Shields	0.00014	0.00014			0.50	1.0				*Hand Solder, w/ Wrapping*
J3 Connector	0.00029	0.00057	1.0	2.02	0.50		0.1	0.01397	22	
Connections	0.0078	0.0026			0.50	1.0				*Hand Solder, w/o Wrapping*
Shields	0.00014	0.00014			0.50	1.0				*Hand Solder, w/ Wrapping*
J5 Connector	0.00031	0.00057	1.0	2.16	0.50		0.1	0.01397	22	
Connections	0.0091	0.0026			0.50	1.0				*Hand Solder, w/o Wrapping*
Shields	0.00014	0.00014			0.50	1.0				*Hand Solder, w/ Wrapping*
J4 Connector	0.00061	0.00057	1.0	4.31	0.50		0.1	0.01397	22	
Connections	0.0286	0.0026			0.50	1.0				*Hand Solder, w/o Wrapping*
Shields	0.00014	0.00014			0.50	1.0				*Hand Solder, w/ Wrapping*
Ground Lug	0.00026	0.00026			0.50	1.0				*Crimp*

	λp	λb	πR	πQ	πE	Watts Rated	Watts Actual	
R1-R4	0.00003	0.00044	1.0	0.03	0.50	2	0.56	
Connections	0.00056	0.00014		1.0	0.50			*Hand Solder, w/ Wrapping*
	0.09320							

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TABLE A1ES-EOS-6

EOS Part Number 1356426-1

Item No.	Qty Reqd	Part Number	Nomenclature	Designation	Active Pins
1	1	1337653-4	CCA, I/O Interface	P302	78
2	1	AS8096-37PHR0	Connector, 37 Pin, HF Filter	J2	28
3	1	AS8381-03-F04N	Connector, 37 Pin, 26AWG Wire	P602	24
4	1	AS8381-03-A04N	Connector, 9 Pin, 26AWG Wire	P705	4
5	1	AS8381-03-G04N	Connector, 51 Pin, 26AWG Wire	P601	42
6	1	311P409-2S-B-12	Connector, Sub-D	J102	14
	1	311P409-2S-B-12	Connector, Sub-D	J202	14

Designation	λp	λb	πK	πP	πE	πQ	i_{AVG}	ΔT	AWG	
P302 Connector	0.00242	0.00057	1.0	17.04	0.50		0.1	0.01397	22	
Connections	0.1014	0.0026			0.50	1.0				*Hand Solder, w/o Wrapping*
J2 Connector	0.00075	0.00057	1.0	5.26	0.50		0.1	0.01397	22	
Connections	0.0364	0.0026			0.50	1.0				*Hand Solder, w/o Wrapping*
P602 Connector	0.00066	0.00057	1.0	4.62	0.50		0.1	0.01397	22	
Connections	0.00312	0.00026			0.50	1.0				*Crimp*
P705 Connector	0.00024	0.00057	1.0	1.72	0.50		0.1	0.01397	22	
Connections	0.00052	0.00026			0.50	1.0				*Crimp*
P601 Connector	0.00114	0.00057	1.0	7.81	0.50		0.1	0.01397	22	
Connections	0.00546	0.00026			0.50	1.0				*Crimp*
J102 Connector	0.00114	0.00057	1.0	1.72	0.50		0.1	0.01397	22	
Connections	0.00052	0.00026			0.50	1.0				*Crimp*
J202 Connector	0.00114	0.00057	1.0	7.81	0.50		0.1	0.01397	22	
Connections	0.00546	0.00026			0.50	1.0				*Crimp*
	0.16035									

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APPENDIX A
SECTION A2
METSAT/EOS
AMSU-A MODULE A2
RELIABILITY PREDICTIONS

Table A2AS METSAT/EOS Module A2
Antenna Subsystem

Nomenclature	Part Number	Quantity (n)	λ (f/10^6 hr)	nλ	λ Source/Remarks
Antenna Assembly	1331210-2	1	0.37603	0.37603	Table A2AS-1
Diplexer	1331084-1	1	0.38243	0.38243	AE-24689B
Compensation Assembly	1333660-1	1	0.3606	0.3606	METSAT only Table A2AS-2

Total METSAT λ = 1.11906
Total EOS λ = 0.75846

Table A2AS-1 METSAT/EOS Module A2
Antenna Assembly P/N 1331210-1

Nomenclature	Part Number	Quantity (n)	λ (f/10^6 hr)	nλ	λ Source/Remarks
Feedhorn	1331231-1	1	0.001	0.001	Aerojet Report 8897-1
Calibration Source and PRT	1331235-1	1	0.008	0.008	Eng Estimate
Drive Assy, Reflector	1333650-1	1	0.36703	0.36703	Table A2AS-1-1

Total METSAT/EOS λ = 0.37603

Table A2AS-1-1 METSAT/EOS Module A2
Antenna Assembly Reflector Drive Assy PN 1333650-1

Nomenclature	Part Number	Quantity (n)	λ (f/10^6 hr)	nλ	λ Source/Remarks
Rotating Assembly	1333651-1	1	0.1500	0.1500	Eng Estimate
Resolver, Brushless	1331529-1	1	0.00713	0.00713	Vernitron
Motor, Torque D.C.	1333648-1	1	0.20980	0.20980	Vernitron
Connector	G311P10-3P-C-15	1	0.0001	0.0001	Eng Estimate

METSAT/EOS λ= 0.36703

Table A2AS-2 Module A2
Compensation Assy P/N 1333660-1 (METSAT only)

Nomenclature	Part Number	Quantity (n)	λ ($f/10^6$ hr)	nλ	λ Source/Remarks
Bearing, Ball, Duplex Set	1333667-2	1	0.15000	0.15000	Aerojet Report 8897-1
Motor, Torque D.C.	1333648-1	1	0.20980	0.20980	Vernitron Production
Connector, Sub D	G311P10-3P-C-15	1	0.0008	0.0008	Eng Estimate

METSAT $\lambda = 0.3606$

Table A2RS Module A2
Receiver Subsystem (RS)

Nomenclature	Part Number	Quantity (n)	λ ($f/10^6$ hr)	nλ	λ Source/Remarks
Thermofoil Heater	1337640-3	2	1.7E-6	3.4E-6	NPRD-91
Connector	AS8096-15PT-0	1	0.005	0.005	Eng Estimate
Thermostatic Switch	1337651-1	2	0.00013	0.00026	NPRD-91
Connector	AS8381-04-F04NA	1	0.005	0.005	Eng Estimate
Connector	AS8381-04-D04NA	1	0.005	0.005	Eng Estimate
Channel 1					
Isolator	1331111-2	1	0.01142	0.01142	AE-26025B
23.8 GHz DRO	1336610-1	1	0.04100	0.04100	AE-24682D
Waveguide Attenuator	1331100-1	1	0.00761	0.00761	AE-26110
Mixer/IF Amplifier	1331562-11	1	0.19230	0.19230	Spacek Labs
Bandpass Filter	1331559-6	1	0.03807	0.03807	AE-24687E
IF Attenuator	1331516-X	1	0.01142	0.01142	AE024868
RF Cable Connectors	SMA Type	3 (pair)	0.003	0.009	Aerojet Report 8897-1
Channel 2					
Isolator	1331112-2	1	0.01142	0.01142	AE-26025B
31.4 GHz DRO	1336610-2	1	0.04100	0.04100	AE-24682D
Waveguide Attenuator	1331100-2	1	0.00761	0.00761	AE-26110
Mixer/IF Amplifier	1331562-12	1	0.19230	0.19230	Spacek labs
Bandpass Filter	1331559-3	1	0.03807	0.03807	AE-2487G
IF Attenuator	1331516-X	1	0.01142	0.01142	Aerojet Report 8897-1
RF Cable Connectors	SMA Type	3 (pair)	0.003	0.009	

Total METSAT/EOS $\lambda = 0.63690$

Table A2ES-METSAT Module A2
Electronics Subsystem

Nomenclature	Part Number	Quantity (n)	λ ($f/10^6$ hr)	nλ	λ Source/Remarks
Detector/Preamp Assembly	1331300-1	1	0.04339	0.04339	Table A2ES-EOS-1
Power Relay and Housekeeping Assy	1356969-2	1	0.07009	0.07009	Table A2ES-METSAT-1 equals P/N 1356908-2. Other misc has no reliability impact
DC-to-DC Converter Assembly	1356010-1	1	0.38243	0.38243	AE-26577
Cables					
Spacecraft Power (W1)	1356431-2	1	0.04440	0.04440	Table A2ES-EOS-21
I/O Interface Power (W2)	1357147-1	1	0.08274	0.08274	Table A2ES-METSAT-3
Scan Drive (W3)	1356946-1	1	0.06024	0.06024	Table A2ES-METSAT-4
I/O Interface (W4)	1356947-1	1	0.14516	0.14516	Table A2ES-METSAT-5
I/O Temp (W5)	1356948-1	1	0.13367	0.13367	Table A2ES-METSAT-6
Cable Extender (W6)	1356817-1	1	0.00204	0.00204	Table A2ES-EOS-22
Cable Extender (W7)	1356818-1	1	0.00710	0.00710	Table A2ES-EOS-23
Cable Extender (W8)	1356819-1	1	0.00241	0.00241	Table A2ES-EOS-24
Signal Proessing Assembly (1331120-2)					
Temp Sensor "A" CCA	1338421	1	0.03278	0.03278	Table A2ES-EOS-7
Temp Sensor "B" CCA (Not Mission Critical)	1331682-1	1	N/A		
Temp Sensor Analog MUX CCA	1331688	1	0.00914	0.00914	Table A2ES-EOS-8
Analog MUX and A/D Converter CCA	1356418	1	0.03684	0.03684	Table A2ES-EOS9
Integrate and Dump Filter CCA	1338424	1	0.01269	0.01269	Table A2ES-EOS-10
Spacecraft Interface No. 1	1331144	1	0.08345	0.08345	Table A2ES-METSAT-7
Spacecraft Interface No. 2	1331147	1	0.05416	0.05416	Table A2ES-METSAT-8
Parallel to Serial Converter	1331150	1	0.06697	0.06697	Table A2ES-METSAT-9
Timing and Control CCA	1331135	1	0.02884	0.02884	Table A2ES-EOS-12
CPU CCA	1356413	1	0.02334	0.02334	Table A2ES-EOS-13
Memory CCA	1331126	1	0.01542	0.01542	Table A2ES-EOS-14
Scan Drive CCAs					
Scan Control Interface CCA	1331129	1	0.00731	0.00731	Table A2ES-EOS-15
Relay Driver and Current Monitor CCA	1356911-2	1	0.06030	0.06030	Table A2ES-METSAT-10
Interface/Converter CCA	1331697	1	0.03492	0.03492	Table A2ES-EOS-17
Resolver-Data Isolator CCA	1334972	1	0.01716	0.01716	Table A2ES-EOS-18
R-D Converter/Oscillator CCA	1337739	1	0.08332	0.08332	Table A2ES-EOS-19
Motor Driver (Comp) CCA	1331694-2	1	0.03874	0.03874	Table A2ES-EOS-20
Motor Driver (Antenna) CCA	1331694-2	1	0.03874	0.03874	Table A2ES-EOS-20

Total A2ES-METSAT λ = 1.6178

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TABLE A2ES-METSAT-1

METSAT UNIQUE

Diodes

Part Number	Ref/Qty	Description	Failure Rate	λb	πT	πS	πC	πQ	πE
AS8301-1N41481S	CR1-CR4	Switching Diode	0.00012	0.001	1.5649	0.054	1	0.7	0.5
AS8301-1N41481S	CR5, CR6	Switching Diode	0.00006	0.001	1.5649	0.054	1	0.7	0.5
AS8301-751A-1	VR1	Zener Diode, Vz=5.1	0.00087	0.002	1.2359	1	1	0.7	0.5

Resistors, Fixed, Composition

Part Number	Ref/Qty	Description	Failure Rate	λb	πR	πQ	πE
RCR05G101JS	R1	100, 0.125W, Est. Rel.	4.0E-06	0.0007	1	0.03	0.2
RCR05G102JS	R2	1k, 0.125W, Est. Rel.	4.7E-06	0.0008	1	0.03	0.2

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Failure Rate	λb	πR	πQ	πE
RLR05C2001FS	R3-R11	2.0k, 1%, 0.125W	0.00006	0.0011	1	0.03	0.2
RLR05C2001FS	R12-R20 (-1 only)	2.0k, 1%, 0.125W	0.00006	0.0011	1	0.03	0.2
RLR05C5491FS	R22, R23	5.49k, 1%, 0.125W	0.00001	0.0011	1	0.03	0.2
RLR05C5491FS	R24, R25 (-1 only)	5.49k, 1%, 0.125W	0.00001	0.0011	1	0.03	0.2
RLR05C8061FS	R26-R28	8.06k, 1%, 0.125W	0.00002	0.0011	1	0.03	0.2
RLR05C8061FS	R29-R33 (-1 only)	8.06k, 1%, 0.125W	0.00003	0.0011	1	0.03	0.2
RLR05C1002FS	R35-R37	10.0k, 1%, 0.125W	0.00002	0.0011	1	0.03	0.2
RLR05C1212FS	R38, R39	12.1k, 1%, 0.125W	0.00001	0.0011	1	0.03	0.2
RLR05C1212FS	R40 (-1 only)	12.1k, 1%, 0.125W	0.00001	0.0011	1	0.03	0.2
RLR05C1502FS	R41-R45	15.0k, 1%, 0.125W	0.00003	0.0011	1	0.03	0.2
RLR05C1502FS	R46-R51 (-1 only)	15.0k, 1%, 0.125W	0.00004	0.0011	1	0.03	0.2
RLR05C1822FS	R53-R56	18.2k, 1%, 0.125W	0.00003	0.0011	1	0.03	0.2
RLR05C1822FS	R57, R58 (-1 only)	18.2k, 1%, 0.125W	0.00001	0.0011	1	0.03	0.2
RLR05C1822FS	R59	18.2k, 1%, 0.125W	0.00001	0.0011	1	0.03	0.2
RLR05C1302FS	R60, R61 (-1 only)	13.0k, 1%, 0.125W	0.00001	0.0011	1	0.03	0.2
RLR05C3012FS	R62, R63 (-1 only)	30.1k, 1%, 0.125W	0.00001	0.0011	1	0.03	0.2

Resistors, Fixed, Wirewound, Power

Part Number	Ref/Qty	Description	Failure Rate	λb	πR	πQ	πE
RWR80S2R00FS	R64, R65 (-1 only)	2.00, 2W	0.00001	0.0011	1	0.03	0.2
RWR80S1R00FS	R64, R65 (-2 only)	1.00, 2W	0.00001	0.0011	1	0.03	0.2
RWR80S1R50FS	R66-R68	1.50, 2W	0.00002	0.0011	1	0.03	0.2
RWR80S1R50FS	R69-R71 (-1 only)	1.50, 2W	0.00002	0.0011	1	0.03	0.2
1331073-36	R72-R74 (-1 only)	Resistor Kit, 0.649 to 1.62Ω	0.00002	0.0011	1	0.03	0.2
1331073-36	R75-R77	Resistor Kit, 0.649 to 1.62Ω	0.00002	0.0011	1	0.03	0.2

METSAT.XLS
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TABLE A2ES-METSAT-1 (Cont.)

METSAT UNIQUE

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	Failure Rate	λb	πCV	πQ	πE
M123A02BXC104KC	C5-C13	0.1uF, 100V, Est. Rel.	0.00011	0.0007	1.4547	0.03	0.4
M123A02BXC104KC	C14-C22 (-1 only)	0.1uF, 100V, Est. Rel.	0.00011	0.0007	1.4547	0.03	0.4
M123A02BXC103KC	C24, C25 (-1 only)	0.1uF, 100V, Est. Rel.	0.00003	0.0007	1.4547	0.03	0.4

Capacitors, Fixed, Electrolytic, Tantalum, Solid

Part Number	Ref/Qty	Description	Failure Rate	λb	πCV	πSR	πQ	πE
M39003/01-8282	C1, C2	3.3uF, 75V, Est. Rel.	0.00008	0.0085	1.1540	0.33	0.03	0.4
M39003/01-8194	C3, C4	1.0uF, 50V, Est. Rel.	0.00004	0.0048	1	0.33	0.03	0.4

Relay, Mechanical

Part Number	Ref/Qty	Description	Failure Rate	λb	πL	πC	πCYC	πF	πQ	πE
G311P754/11-001	K3, K4	Latching, 4PDT	0.01922	0.0061	4.7707	5.5	1	6	0.6	0.5

Connectors	Ref/Qty	Description	Failure Rate	λb	πK	πP	πE
AS8387-23-28A	J702	37-Pin, Rt. Angle, PWB-type	0.00138	0.0003	1.5	6.4758	0.5
AS8387-16-F01NP	J703	Rt. Angle, PWB-type	0.00109	0.0003	1.5	5.0984	0.5
AS8387-16-D01NP	J704	Rt. Angle, PWB-type	0.00070	0.0003	1.5	3.2787	0.5
AS8387-10-D01NP	J705	Rt. Angle, PWB-type	0.00089	0.0003	1.5	4.1565	0.5
AS8387-19-F01NP	J706	Rt. Angle, PWB-type	0.00127	0.0003	1.5	5.9418	0.5

Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty	Description	Failure Rate	λb	πC	πQ	πE	N1	N2
1356910-1	1 (-1 Assembly)	PWB, Pwr Relay/Hskp	0.05677	1.7E-05	2.0098	1	0.5	0	445
1356910-1	1 (-2 Assembly)	PWB, Pwr Relay/Hskp	0.04402	1.7E-05	2.0098	1	0.5	0	345

-1 Failure Rate: 0.08324
-2 Failure Rate: 0.07009

TABLE A2ES-METSAT-1 (Cont.)

METSAT.XLS
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METSAT UNIQUE

Diodes

Part Number	Ref/Qty	Description	Contact	Type/App	Rated Voltage	Applied Voltage	Junct. Temp.	Actual Watts	θjl (°C/W)	Case	Quality
AS8301-1N41481S	CR1-CR4	Switching Diode	*Metal*	*Switch*	*75*	*1*	*38.45*	*28.7E-3*	*120*	*DO-35*	*JANTXV*
AS8301-1N41481S	CR5, CR6	Switching Diode	*Metal*	*Switch*	*75*	*1*	*38.45*	*28.7E-3*	*120*	*DO-35*	*JANTXV*
AS8301-751A-1	VR1	Zener Diode, Vz=5.1	*Metal*	*V. Ref.*	*n/a*	*n/a*	*35.10*	*0.01*	*10*	*DO-35*	*JANTXV*

Resistors, Fixed, Composition

Part Number	Ref/Qty	Description	Ohms	Rated Power	Actual Power	Quality
RCR05G101JS	R1	100, 0.125W, Est. Rel.	*100*	*0.125*	*0.00207*	*S*
RCR05G102JS	R2	1k, 0.125W, Est. Rel.	*1000*	*0.125*	*0.0207*	*S*

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Ohms	Rated Power	Actual Power	Quality
RLR05C2001FS	R3-R11	2.0k, 1%, 0.125W	*2000*	*0.125*	*0.0625*	*S*
RLR05C2001FS	R12-R20 (-1 only)	2.0k, 1%, 0.125W	*2000*	*0.125*	*0.0625*	*S*
RLR05C5491FS	R22, R23	5.49k, 1%, 0.125W	*5490*	*0.125*	*0.0625*	*S*
RLR05C5491FS	R24, R25 (-1 only)	5.49k, 1%, 0.125W	*5490*	*0.125*	*0.0625*	*S*
RLR05C8061FS	R26-R28	8.06k, 1%, 0.125W	*8060*	*0.125*	*0.0625*	*S*
RLR05C8061FS	R29-R33 (-1 only)	8.06k, 1%, 0.125W	*8060*	*0.125*	*0.0625*	*S*
RLR05C1002FS	R35-R37	10.0k, 1%, 0.125W	*10000*	*0.125*	*0.0625*	*S*
RLR05C1212FS	R38, R39	12.1k, 1%, 0.125W	*12100*	*0.125*	*0.0625*	*S*
RLR05C1212FS	R40 (-1 only)	12.1k, 1%, 0.125W	*12100*	*0.125*	*0.0625*	*S*
RLR05C1502FS	R41-R45	15.0k, 1%, 0.125W	*15000*	*0.125*	*0.0625*	*S*
RLR05C1502FS	R46-R51 (-1 only)	15.0k, 1%, 0.125W	*15000*	*0.125*	*0.0625*	*S*
RLR05C1822FS	R53-R56	18.2k, 1%, 0.125W	*18200*	*0.125*	*0.0625*	*S*
RLR05C1822FS	R57, R58 (-1 only)	18.2k, 1%, 0.125W	*18200*	*0.125*	*0.0625*	*S*
RLR05C1822FS	R59	18.2k, 1%, 0.125W	*18200*	*0.125*	*0.0625*	*S*
RLR05C1302FS	R60, R61 (-1 only)	13.0k, 1%, 0.125W	*13000*	*0.125*	*0.0625*	*S*
RLR05C3012FS	R62, R63 (-1 only)	30.1k, 1%, 0.125W	*30100*	*0.125*	*0.0625*	*S*

Resistors, Fixed, Wirewound, Power

Part Number	Ref/Qty	Description	Ohms	Rated Power	Actual Power	Quality
RWR80S2R00FS	R64, R65 (-1 only)	2.00, 2W	*2*	*2*	*1*	*S*
RWR80S1R00FS	R64, R65 (-2 only)	1.00, 2W	*1*	*2*	*1*	*S*
RWR80S1R50FS	R66-R68	1.50, 2W	*1.5*	*2*	*1*	*S*
RWR80S1R50FS	R69-R71 (-1 only)	1.50, 2W	*1.5*	*2*	*1*	*S*
1331073-36	R72-R74 (-1 only)	Resistor Kit, 0.649 to 1.62Ω	*1.62*	*2*	*1*	*S*
1331073-36	R75-R77	Resistor Kit, 0.649 to 1.62Ω	*1.62*	*2*	*1*	*S*

TABLE A2ES-METSAT-1 (Cont.)

METSAT.XLS
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METSAT UNIQUE

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	pF	Rated Temp.	Rated Voltage	Actual Voltage	Quality
M123A02BXC104KC	C5-C13	0.1uF, 100V, Est. Rel.	100000	125	100	15	S
M123A02BXC104KC	C14-C22 (-1 only)	0.1uF, 100V, Est. Rel.	100000	125	100	15	S
M123A02BXC103KC	C24, C25 (-1 only)	0.1uF, 100V, Est. Rel.	100000	125	100	15	S

Capacitors, Fixed, Electrolytic, Tantalum, Solid

Part Number	Ref/Qty	Description	uF	Rated Temp.	Rated Voltage	Actual Voltage	Quality
M39003/01-8282	C1, C2	3.3uF, 75V, Est. Rel.	3.3	85	75	28	S
M39003/01-8194	C3, C4	1.0uF, 50V, Est. Rel.	1.0	85	50	5	S

Relay, Mechanical

Part Number	Ref/Qty	Description	Oper. Load	Rated Load	Load Type	Contact Form	Rated Temp	Cycles per Hour	Quality	Duty Cycle
G311P754/11-001	K3, K4	Latching, 4PDT	0.25	0.5	Induct.	4PDT	85	0.1	U	0.01

Connectors	Ref/Qty	Description	Active Pins	Pin Gauge	Avg. Current	Temp. Rise	Quality	Mate / Unmate per 1000 hours
AS8387-23-28A	J702	37-Pin, Rt. Angle, PWB-type	35	20	0.1	0.01	Mil	0.5
AS8387-16-F01NP	J703	Rt. Angle, PWB-type	27	20	0.1	0.01	Mil	0.5
AS8387-16-D01NP	J704	Rt. Angle, PWB-type	15	20	0.1	0.01	Mil	0.5
AS8387-10-D01NP	J705	Rt. Angle, PWB-type	21	20	0.1	0.01	Mil	0.5
AS8387-19-F01NP	J706	Rt. Angle, PWB-type	32	20	0.1	0.01	Mil	0.5

Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty	Description	Layers	Quality	Wave Solder	Hand Solder
1356910-1	1 (-1 Assembly)	PWB, Pwr Relay/Hskp	6	Mil	PTHs->	445
1356910-1	1 (-2 Assembly)	PWB, Pwr Relay/Hskp	6	Mil	PTHs->	345

TABLE A2ES-METSAT-3

METSAT Part Number 1357147

Item No.	Qty Reqd	Part Number	Nomenclature	Designation	Active Pins
1	1	1337653-2	CCA, I/O Interface	P324	39
2	1	AS8096-25PLR0	Connector	P902	23
3	1	AS8381-04-G04NA	Connector, 51 Pin, 26AWG Wire	P706	16

Designation	λp	λb	πK	πP	πE	πQ	i_{AVG}	ΔT	AWG
P324 Connector	0.00103	0.00057	1.0	7.22	0.50		0.1	0.01397	22
Connections	0.0507	0.0026			0.50	1.0			*Hand Solder, w/o Wrapping*
P902 Connector	0.00063	0.00057	1.0	4.46	0.50		0.1	0.01397	22
Connections	0.0299	0.0026			0.50	1.0			*Hand Solder, w/o Wrapping*
P706 Connector	0.00049	0.00057	1.0	3.42	0.50		0.1	0.01397	22
Connections	0.00208	0.00026			0.50	1.0			*Crimp*
	0.08274								

TABLE A2ES-METSAT-4

METSAT Part Number 1356946

Item No.	Qty Reqd	Part Number	Nomenclature	Designation	Connections/Pins
1	1	1337653-3	CCA, I/O Interface	P327	33
2	1	1356784-1	Transistor Assy		31
3	1	311P409-3P-B-12	Connector, Sub-D	P702	13
4	1	311P409-3S-B-12	Connector, Sub-D	P101	20

Designation	λp	λb	πK	πP	πE	πQ	i_{AVG}	ΔT	AWG	
P327	0.00087	0.00057	1.0	6.12	0.50		0.1	0.01397	22	
	0.0429	0.0026			0.50	1.0				*Hand Solder, w/o Wrapping*
Transistor Assy	0.00901	(see assembly 1356784 failure rate calculations)								
Connections	0.00217	0.00014			0.50	1.0				*Hand Solder, w/ Wrapping*
P702	0.00043	0.00057	1.0	3.00	0.50		0.1	0.01397	22	
	0.00169	0.00026			0.50	1.0				*Crimp*
P101	0.00057	0.00057	1.0	4.01	0.50		0.1	0.01397	22	
	0.0026	0.00026			0.50	1.0				*Crimp*
	0.06024									

METSAT Part Number 1356947

TABLE A2ES-METSAT-5

Item No.	Qty Reqd	Part Number	Nomenclature	Designation	Pins/Connections
1	1	1337653-3	CCA, I/O Interface	P301	48
2	1	AS8096-9SHRO	Connector, 9 Skt, HF Filter	J2	6
3	1	26139-1	Connector,	J3	6
4	1	AS8096-25PHRO	Connector, 25 Pin, HF Filter	J4	18
5	1	AS8096-15SHRO	Connector, 15 Skt, HF Filter	J5	11
7	1	AS8096-37SHRO	Connector, 37 Skt, HF Filter	J7	13

Designation	λp	λb	πK	πP	πE	πQ	i_{AVG}	ΔT	AWG	
P301 Connector	0.00129	0.00057	1.0	9.06	0.50		0.1	0.01397	22	
Connections	0.0637	0.0026			0.50	1.0				*Hand Solder, w/o Wrapping*
Ground Lug	0.00026	0.00026			0.50	1.0				*Crimp*
J2 Connector	0.00029	0.00057	1.0	2.02	0.50		0.1	0.01397	22	
Connections	0.0091	0.0026			0.50	1.0				*Hand Solder, w/o Wrapping*
Ground Lug	0.00026	0.00026			0.50	1.0				*Crimp*
J3 Connector	0.00029	0.00057	1.0	2.02	0.50		0.1	0.01397	22	
Connections	0.0091	0.0026			0.50	1.0				*Hand Solder, w/o Wrapping*
Ground Lug	0.00026	0.00026			0.50	1.0				*Crimp*
J4 Connector	0.00053	0.00057	1.0	3.71	0.50		0.1	0.01397	22	
Connections	0.0247	0.0026			0.50	1.0				*Hand Solder, w/o Wrapping*
Ground Lug	0.00026	0.00026			0.50	1.0				*Crimp*
J5 Connector	0.00039	0.00057	1.0	2.72	0.50		0.1	0.01397	22	
Connections	0.0156	0.0026			0.50	1.0				*Hand Solder, w/o Wrapping*
Ground Lug	0.00026	0.00026			0.50	1.0				*Crimp*
J7 Connector	0.00043	0.00057	1.0	3.00	0.50		0.1	0.01397	22	
Connections	0.0182	0.0026			0.50	1.0				*Hand Solder, w/o Wrapping*
Ground Lug	0.00026	0.00026			0.50	1.0				*Crimp*
	0.14516									

A2W4 Cable Assembly

TABLE A2ES-METSAT-6

METSAT Part Number 1356948

Item No.	Qty Reqd	Part Number	Nomenclature	Designation	Active Pins
1	1	1337653-4	CCA, I/O Interface	P302	46
2	1	AS8096-37PHR0	Connector, 37Pin, HF Filter	J6	17
3	1	311P409-2S-B-12	Connector, Sub-D	P511	12
4	1	AS8096-24PLR0	Connector, 24 Pin, LF Filter	J102	17
5	1	AS8381-03-F04N	Connector w/26AWG Wire	P602	19

Designation	λp	λb	πK	πP	πE	πQ	i_{AVG}	ΔT	AWG
P302 Connector	0.00123	0.00057	1.0	8.63	0.50		0.1	0.01397	22
Connections	0.0598	0.0026			0.50	1.0			*Hand Solder, w/o Wrapping*
J6 Connector	0.00051	0.00057	1.0	3.57	0.50		0.1	0.01397	22
Connections	0.0221	0.0026			0.50	1.0			*Hand Solder, w/o Wrapping*
Ground Lug	0.00026	0.00026			0.50	1.0			*Crimp*
P511 Connector	0.00041	0.00057	1.0	2.86	0.50		0.1	0.01397	22
Connections	0.00156	0.00026			0.50	1.0			*Crimp*
J102 Connector	0.00051	0.00057	1.0	3.57	0.50		0.1	0.01397	22
Connections	0.0221	0.0026			0.50	1.0			*Hand Solder, w/o Wrapping*
P602 Connector	0.00051	0.00057	1.0	3.57	0.50		0.1	0.01397	22
Connections	0.0247	0.0026			0.50	1.0			*Hand Solder, w/o Wrapping*
	0.13367								

TABLE A2ES-METSAT-7

METSAT.XLS
03/13/1996

METSAT UNIQUE

Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Failure Rate	πT	πE	πQ	πL	C1	C2
AS8083-27	U1	3-to-8 Line Decoder	0.00110	0.16218	0.5	0.25	1	0.01	0.00559
AS8083-28	U2, U15, U16	8-Bit I/O Port	0.00448	0.16389	0.5	0.25	1	0.01	0.00867
AS8083-08	U3, U5, U6	Hex Inverter (Schmitt Trig.)	0.00310	0.17121	0.5	0.25	1	0.01	0.00484
AS8083-08	U4	Hex Inverter (Schmitt Trig.)	0.00101	0.16328	0.5	0.25	1	0.01	0.00484
AS8322R05554SEX	U8-U10	Hex Buffer	0.00335	0.16721	0.5	0.25	1	0.01	0.00559
AS8332R05554SEX	U11	Hex Buffer	0.00111	0.16328	0.5	0.25	1	0.01	0.00559
AS8083-27	U17-U19	8-Bit I/O Port	0.00448	0.16389	0.5	0.25	1	0.01	0.00867
AS8332R17401SCX	U21	Hex Inverter	0.00101	0.16135	0.5	0.25	1	0.01	0.00484

Diodes, Low Frequency

Part Number	Ref/Qty	Description	Failure Rate	λb	πT	πS	πC	πQ	πE
AS8301-1N5417-S	CR1	Fast Switching Rectifier	0.00003	0.00100	1.40498	0.054	1	0.7	0.5

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Failure Rate	λb	πR	πQ	πE
RNC60E1100FS	R1	110-ohm, 1%, 0.125W	0.00001	0.00105	1	0.03	0.2
RNC60E2001FS	R2, R4	2k, 1%, 0.125W	0.00001	0.00066	1	0.03	0.2
RNC60E1003FS	R3	100k, 1%, 0.125W *	4.5E-06	0.00068	1.1	0.03	0.2
RNC60E1001FS	R5	1k, 1%, 0.125W	3.9E-06	0.00066	1	0.03	0.2

Resistors, Network, Fixed, Film

Part Number	Ref/Qty	Description	Failure Rate	λb	πT	πNR	πQ	πE
26046-6	RN1	100k, 0.125W	0.00019	0.00006	1.25426	5	1	0.5
26046-6	RN3, RN4	100k, 0.125W	0.00030	0.00006	1.25426	4	1	0.5
26046-6	RN6	100k, 0.125W	0.00008	0.00006	1.25426	2	1	0.5
26046-6	RN8, 10, 12, 14	100k, 0.125W	0.00090	0.00006	1.25426	6	1	0.5
26046-3	RN2	2k, 0.125W	0.00008	0.00006	1.37863	2	1	0.5
26046-3	RN5	2k, 0.125W	0.00004	0.00006	1.37863	1	1	0.5
26046-3	RN7,9,11,13,15,17	2k, 0.125W	0.00074	0.00006	1.37863	3	1	0.5
26046-2	RN16, RN18	100k, 0.125W	0.00015	0.00006	1.25426	2	1	0.5

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	Failure Rate	λb	πCV	πQ	πE
M123A02BXC104KC	C2, C37-42	Est. Rel., 0.1uF, 50V	0.00009	0.00073	1.45473	0.03	0.4
M123A02BXC104KC	C4-8, C13	Est. Rel., 0.1uF, 50V	0.00009	0.00091	1.45473	0.03	0.4
M39014/01-1571	C11,12,14-17,20-35	Est. Rel., 5600pF, 100V	0.00019	0.00073	1.05946	0.03	0.4

TABLE A2ES-METSAT-7 (Cont.)

METSAT UNIQUE

Capacitors, Fixed, Electrolytic, Tantalum

Part Number	Ref/Qty	Description	Failure Rate	λb	πCV	πSR	πQ	πE
M39003/01-8209	C1	Est. Rel., 3.3uF, 50V	0.00002	0.00476	1.15404	0.33	0.03	0.4
M39003/01-8209	C3	Est. Rel., 3.3uF, 50V	0.00002	0.00527	1.15404	0.33	0.03	0.4

Connector, PCB	Ref/Qty	Description	Failure Rate	λb	πK	πP	πE
1337748-1	P1	Connector	0.00337	0.00028	1.5	15.79363	0.5

Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty	Description	Failure Rate	λb	πC	πQ	πE	N1	N2
1337294-1	1	PWB, Spacecraft I/F No 1	0.07617	0.00002	2.00978	1	0.5	0	597

Total Failure Rate: 0.10214

TABLE A2ES-METSAT-7 (Cont.)

METSAT.XLS
03/13/1996

METSAT UNIQUE

Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Compl.	Tech.	Ea	Junct. Temp.	Watts	θjc (°C/W)	Pins	Mfr Years	Package	Quality
AS8083-27	U1	3-to-8 Line Decoder	32	Digital	0.35	35.96	0.08	12	16	>2	Hermetic	S
AS8083-28	U2, U15, U16	8-Bit I/O Port	46	Digital	0.35	36.21	0.08	15.1	24	>2	Hermetic	S
AS8083-08	U3, U5, U6	Hex Inverter (Schmitt Trig.)	18	Digital	0.35	37.24	0.08	28	14	>2	Hermetic	S
AS8083-08	U4	Hex Inverter (Schmitt Trig.)	12	Digital	0.35	36.12	0.04	28	14	>2	Hermetic	S
AS8322R05554SEX	U8-U10	Hex Buffer	4	Digital	0.35	36.68	0.06	28	16	>2	Hermetic	S
AS8332R05554SEX	U11	Hex Buffer	3	Digital	0.35	36.12	0.04	28	16	>2	Hermetic	S
AS8083-27	U17-U19	8-Bit I/O Port	46	Digital	0.35	36.21	0.08	15.1	24	>2	Hermetic	S
AS8332R17401SCX	U21	Hex Inverter	3	Digital	0.35	35.84	0.03	28	14	>2	Hermetic	S

Diodes, Low Frequency

Part Number	Ref/Qty	Description	Contact	Type/App	Rated Voltage	Applied Voltage	Junct. Temp.	Actual Watts	θjc (°C/W)	Case	Quality
AS8301-1N5417-S	CR1	Fast Switching Rectifier	Metal	Switch	100	10	35.10	0.01	10	DO-41	JANTXV

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Ohms	Rated Power	Actual Power	Quality
RNC60E1100FS	R1	110-ohm, 1%, 0.125W	110	0.125	0.05455	S
RNC60E2001FS	R2, R4	2k, 1%, 0.125W	2000	0.125	0.0025	S
RNC60E1003FS	R3	100k, 1%, 0.125W	100000	0.125	0.005	S
RNC60E1001FS	R5	1k, 1%, 0.125W	1000	0.125	0.0015	S

Resistors, Network, Fixed, Film

Part Number	Ref/Qty	Description	Ohms	Rated Power	Actual Power	Quality
26046-6	RN1	100k, 0.125W	100000	0.125	0.0001	S
26046-6	RN3, RN4	100k, 0.125W	100000	0.125	0.0001	S
26046-6	RN6	100k, 0.125W	100000	0.125	0.0001	S
26046-6	RN8, 10, 12, 14	100k, 0.125W	100000	0.125	0.0001	S
26046-3	RN2	2k, 0.125W	2000	0.125	0.005	S
26046-3	RN5	2k, 0.125W	2000	0.125	0.005	S
26046-3	RN7,9,11,13,15,17	2k, 0.125W	2000	0.125	0.005	S
26046-2	RN16, RN18	100k, 0.125W	100000	0.125	0.0001	S

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	pF	Rated Temp.	Rated Voltage	Actual Voltage	Quality
M123A02BXC104KC	C2, C37-42	Est. Rel., 0.1uF, 50V	100000	85	50	5	S
M123A02BXC104KC	C4-8, C13	Est. Rel., 0.1uF, 50V	100000	85	50	10	S
M39014/01-1571	C11,12,14-17,20-35	Est. Rel., 5600pF, 100V	5600	85	100	10	S

TABLE A2ES-METSAT-7 (Cont.)

METSAT.XLS
03/13/1996

METSAT UNIQUE

Capacitors, Fixed, Electrolytic, Tantalum

Part Number	Ref/Qty	Description	uF	Rated Temp.	Rated Voltage	Actual Voltage	Quality
M39003/01-8209	C1	Est. Rel., 3.3uF, 50V	3.3	85	50	5	S
M39003/01-8209	C3	Est. Rel., 3.3uF, 50V	3.3	85	50	10	S

Connector, PCB	Ref/Qty	Description	Active Pins	Pin Gauge	Avg. Current	Temp. Rise	Quality	Mate / Unmate per 1000 hours
1337748-1	P1	Connector	74	26	0.1	0.03	Mil	0.5

Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty	Description	Layers	Quality	Wave Solder	Hand Solder
1337294-1	1	PWB, Spacecraft I/F No 1	6	Mil	PTHs->	597

TABLE A2ES-METSAT-8

METSAT UNIQUE

METSAT.XLS
03/13/1996

Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Failure Rate	πT	πE	πQ	πL	C1	C2
AS8083-08	U1	Hex Inverter (Schmitt Trig.)	0.00100	0.15614	0.5	0.25	1	0.01	0.00484
AS8332R05554SEX	U2	Hex Buffer	0.00110	0.16173	0.5	0.25	1	0.01	0.00559
AS8083-08	U5, U6	Hex Inverter (Schmitt Trig.)	0.00199	0.15692	0.5	0.25	1	0.01	0.00484
AS8083-08	U7	Hex Inverter (Schmitt Trig.)	0.00100	0.1565	0.5	0.25	1	0.01	0.00484
AS8083-08	U8	Hex Inverter (Schmitt Trig.)	0.00101	0.16218	0.5	0.25	1	0.01	0.00484
AS8083-06	U9	Voltage Level Shifter	0.00110	0.15971	0.5	0.25	1	0.01	0.00559

Diodes, Low Frequency

Part Number	Ref/Qty	Description	Failure Rate	λb	πT	πS	ΠC	πQ	πE
AS8301-1N5417-S	CR1	Fast Switching Rectifier	0.00003	0.001	1.44664	0.054	1	0.7	0.5
AS8301-751A-1	VR1	Zener Diode, Vz=5.1	0.00087	0.002	1.23585	1	1	0.7	0.5

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Failure Rate	λb	πR	πQ	πE
RNC60E1100FS	R1	110-ohm, 1%, 0.125W	5.8E-06	0.00097	1	0.03	0.2
RNC60B1001FS	R2	1K, 1%, 0.125W	4.1E-06	0.00068	1	0.03	0.2
RNC60J2001FS	R3, R5	2K, 1%, 0.125W	8.1E-06	0.00068	1	0.03	0.2
RNC60E1002FS	R4	10K, 1%, 0.125W	3.9E-06	0.00065	1	0.03	0.2
RNC60E2000FS	R6	200-ohm, 1%, 0.125W	6.1E-06	0.00101	1	0.03	0.2

Resistors, Network, Fixed, Film

Part Number	Ref/Qty	Description	Failure Rate	λb	πT	πNR	πQ	πE
26046-3	RN1, 2, 18, 20, 23, 25, 2	2k, 0.125W	0.00087	0.00006	1.37863	3	1	0.5
26046-6	RN3, RN4	100k, 0.125W	0.00045	0.00006	1.25426	6	1	0.5
26046-1	RN22, 24, 26, 28	10k, 0.125W	0.00046	0.00006	1.27636	3	1	0.5
26046-2	RN29, RN30	100k, 0.125W	0.00015	0.00006	1.25426	2	1	0.5
26046-3	RN31	2k, 0.125W	0.00008	0.00006	1.37863	2	1	0.5

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	Failure Rate	λb	πCV	πQ	πE
M123A02BXC104KC	C1	Est. Rel., 0.1uF, 100V	1.27E-05	0.00073	1.45473	0.03	0.4
M39014/01-1351	C2-C5	Est. Rel., 470pF, 200V	2.72E-05	0.0007	0.8067	0.03	0.4
M39014/01-1571	C6, C47, C48	Est. Rel., 5600pF, 100V	2.77E-05	0.00073	1.05946	0.03	0.4
M123A02BXC104KC	C19-C34	Est. Rel., 0.1uF, 100V	1.96E-04	0.0007	1.45473	0.03	0.4
M39014/01-1347	C35	Est. Rel., 270pF, 200V	6.40E-06	0.0007	0.75899	0.03	0.4
M123A02BXC104KC	C36, C42	Est. Rel., 0.1uF, 100V	2.53E-05	0.00073	1.45473	0.03	0.4
M123A02BXC104KC	C39-C41	Est. Rel., 0.1uF, 100V	3.68E-05	0.0007	1.45473	0.03	0.4
M123A02BXC104KC	C43	Est. Rel., 0.1uF, 100V	1.23E-05	0.0007	1.45473	0.03	0.4

Part Number: 1331147

Spacecraft Interface No. 2 Circuit Card Assembly

Schematic: 1331148

TABLE A2ES-METSAT-8 (Cont.)

METSAT.XLS
03/13/1996

METSAT UNIQUE

Capacitors, Fixed, Electrolytic, Tantalum

Part Number	Ref/Qty	Description	Failure Rate	λb	πCV	πSR	πQ	πE
M39003/01-8209	C44	Est. Rel., 3.3uF, 50V	2.41E-05	0.00527	1.15404	0.33	0.03	0.4
M39003/01-8209	C45	Est. Rel., 3.3uF, 50V	2.18E-05	0.00476	1.15404	0.33	0.03	0.4
M39003/01-8209	C46	Est. Rel., 3.3uF, 50V	2.17E-05	0.00475	1.15404	0.33	0.03	0.4

Connector, PCB	Ref/Qty	Description	Failure Rate	λb	πK	πP	πE
1337748-1	P1	Connector	0.00254	0.00028	1.5	11.8853	0.5

Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty	Description	Failure Rate	λb	πC	πQ	πE	N1	N2
1337295-1	1	PWB, Spacecraft I/F No 2	0.04828	1.7E-05	1.7917	1	0.5	0	384

Total Failure Rate: 0.06136

TABLE A2ES-METSAT-8 (Cont.)

METSAT.XLS
03/13/1996

METSAT UNIQUE

Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Compl.	Tech.	Ea	Junct. Temp.	Watts	θjc (°C/W)	Pins	Mfr Years	Package	Quality
AS8083-08	U1	Hex Inverter (Schmitt Trig.)	18	Digital	0.35	35.07	0.006	12	14	>2	Hermetic	S
AS8332R05554SEX	U2	Hex Buffer	6	Digital	0.35	35.90	0.032	28	16	>2	Hermetic	S
AS8083-08	U5, U6	Hex Inverter (Schmitt Trig.)	18	Digital	0.35	35.19	0.01561	12	14	>2	Hermetic	S
AS8083-08	U7	Hex Inverter (Schmitt Trig.)	18	Digital	0.35	35.12	0.0104	12	14	>2	Hermetic	S
AS8083-08	U8	Hex Inverter (Schmitt Trig.)	12	Digital	0.35	35.96	0.08	12	14	>2	Hermetic	S
AS8083-06	U9	Voltage Level Shifter	32	Digital	0.35	35.60	0.05	12	16	>2	Hermetic	S

Diodes, Low Frequency

Part Number	Ref/Qty	Description	Contact	Type/App	Rated Voltage	Applied Voltage	Junct. Temp.	Actual Watts	θjc (°C/W)	Case	Quality
AS8301-1N5417-S	CR1	Fast Switching Rectifier	Metal	Switch	100	10	36.00	0.1	10	DO-41	JANTXV
AS8301-751A-1	VR1	Zener Diode, Vz=5.1	Metal	V. Ref.	n/a	n/a	35.10	0.01	10	DO-35	JANTXV

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Ohms	Rated Power	Actual Power	Quality
RNC60E1100FS	R1	110-ohm, 1%, 0.125W	110	0.125	0.0455	S
RNC60B1001FS	R2	1K, 1%, 0.125W	1000	0.125	0.0053	S
RNC60J2001FS	R3, R5	2K, 1%, 0.125W	2000	0.125	0.0050	S
RNC60E1002FS	R4	10K, 1%, 0.125W	10000	0.125	0.0010	S
RNC60E2000FS	R6	200-ohm, 1%, 0.125W	200	0.125	0.0500	S

Resistors, Network, Fixed, Film

Part Number	Ref/Qty	Description	Ohms	Rated Power	Actual Power	Quality
26046-3	RN1, 2, 18, 20, 23, 25, 2	2k, 0.125W	2000	0.125	0.0050	S
26046-6	RN3, RN4	100k, 0.125W	100000	0.125	0.0001	S
26046-1	RN22, 24, 26, 28	10k, 0.125W	10000	0.125	0.0010	S
26046-2	RN29, RN30	100k, 0.125W	100000	0.125	0.0001	S
26046-3	RN31	2k, 0.125W	2000	0.125	0.0050	S

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	pF	Rated Temp.	Rated Voltage	Actual Voltage	Quality
M123A02BXC104KC	C1	Est. Rel., 0.1uF, 100V	100000	85	100	10	S
M39014/01-1351	C2-C5	Est. Rel., 470pF, 200V	470	85	200	10	S
M39014/01-1571	C6, C47, C48	Est. Rel., 5600pF, 100V	5600	85	100	10	S
M123A02BXC104KC	C19-C34	Est. Rel., 0.1uF, 100V	100000	85	100	4.7	S
M39014/01-1347	C35	Est. Rel., 270pF, 200V	270	85	200	10	S
M123A02BXC104KC	C36, C42	Est. Rel., 0.1uF, 100V	100000	85	100	10	S
M123A02BXC104KC	C39-C41	Est. Rel., 0.1uF, 100V	100000	85	100	4.7	S
M123A02BXC104KC	C43	Est. Rel., 0.1uF, 100V	100000	85	100	5	S

TABLE A2ES-METSAT-8 (Cont.)

METSAT.XLS
03/13/1996

METSAT UNIQUE

Capacitors, Fixed, Electrolytic, Tantalum

Part Number	Ref/Qty	Description	*uF*	*Rated Temp.*	*Rated Voltage*	*Actual Voltage*	*Quality*
M39003/01-8209	C44	Est. Rel., 3.3uF, 50V	*3.3*	*85*	*50*	*10*	*S*
M39003/01-8209	C45	Est. Rel., 3.3uF, 50V	*3.3*	*85*	*50*	*5*	*S*
M39003/01-8209	C46	Est. Rel., 3.3uF, 50V	*3.3*	*85*	*50*	*4.7*	*S*

Connector, PCB	Ref/Qty	Description	*Active Pins*	*Pin Gauge*	*Avg. Current*	*Temp. Rise*	*Quality*	*Mate / Unmate per 1000 hours*
1337748-1	P1	Connector	*60*	*26*	*0.1*	*0.03*	*Mil*	*0.5*

Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty	Description	*Layers*	*Quality*	*Wave Solder*	*Hand Solder*
1337295-1	1	PWB, Spacecraft I/F No 2	*5*	*Mil*	*PTHs->*	*384*

METSAT.XLS
03/13/1996

TABLE A2ES-METSAT-9

METSAT_UNIQUE

Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Failure Rate	πT	πE	πQ	πL	C1	C2
25012/03-1	U1	3-to-8 Line Decoder	0.00109	0.15651	0.5	0.25	1	0.01	0.00559
25012/02-1	U2-U5	8-Bit I/O Port	0.00590	0.15672	0.5	0.25	1	0.01	0.00867
25012/10-2	U6, U7	Parallel FIFO (1K x 9)	0.00822	0.1753	0.5	0.25	1	0.08	0.00484
M38510H05754SEX	U8, U9	8-Stage Static Shift Register	0.00218	0.15687	0.5	0.25	1	0.01	0.00559
M38510H05553SEX	U10	Hex Inverter	0.00100	0.15781	0.5	0.25	1	0.01	0.00484
26043-8	U11	Hex Inverter (Schmitt Trig.)	0.00100	0.15687	0.5	0.25	1	0.01	0.00484
M38510H05554SEX	U12	Hex Buffer	0.00100	0.15781	0.5	0.25	1	0.01	0.00484
M38510H05151SCX	U13	Dual 'D' Flip-Flop	0.00100	0.15687	0.5	0.25	1	0.01	0.00484
M38510R17001SCX	U14	Quad AND	0.00100	0.15687	0.5	0.25	1	0.01	0.00484
M38510H17101SCX	U15	Quad OR	0.00100	0.15687	0.5	0.25	1	0.01	0.00484
25012/13-1	U17	Hex Buffer	0.00110	0.15889	0.5	0.25	1	0.01	0.00559

Resistors, Fixed, Composition

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠR	ΠQ	ΠE
RCR07G104JS	R1-R17	Est. Rel., 100K, 0.25W	7.14E-05	0.0007	1	0.03	0.2
RCR07G511JS	R19, R20	Est. Rel., 510, 0.25W	8.40E-06	0.0007	1	0.03	0.2

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Failure Rate	λb	πR	πQ	πE
RNC60E1651FS	R18, R23	1.65K, 1%, 0.125W	7.98E-06	0.00067	1	0.03	0.2
RNC55J3161FS	R21	3.16K, 1%, 0.1W	3.95E-06	0.00066	1	0.03	0.2
RNC55J1781FS	R22	1.78K, 1%, 0.1W	4.01E-06	0.00067	1	0.03	0.2
RNC55J4022FS	R24	40.2K, 1%, 0.1W	3.89E-06	0.00065	1	0.03	0.2

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	Failure Rate	λb	πCV	πQ	πE
M123A02BPC391FC	C1, C6	Est. Rel., 0.1uF, 100V	1.33E-05	0.0007	0.79032	0.03	0.4
M39014/01-1339	C2, C3	Est. Rel., 100pF, 200V	1.14E-05	0.0007	0.68043	0.03	0.4
M39014/01-1329	C4	Est. Rel., 27pF, 200V	4.95E-06	0.0007	0.58916	0.03	0.4
M123A02BXB104KC	C8, C11-C19	Est. Rel., 0.1uF, 100V	1.23E-04	0.0007	1.45473	0.03	0.4
M39014/01-1575	C9, C10	Est. Rel., 0.1uF, 100V	2.45E-05	0.0007	1.45473	0.03	0.4

Capacitors, Fixed, Electrolytic, Tantalum

Part Number	Ref/Qty	Description	Failure Rate	λb	πCV	πSR	πQ	πE
M39003/01-8209	C7	Est. Rel., 3.3uF, 50V	2.18E-05	0.00476	1.15404	0.33	0.03	0.4

Part Number: 1331150 **Parallel to Serial Converter Circuit Card Assembly** Schematic: 1331151

TABLE A2ES-METSAT-9(Cont.)

METSAT.XLS
03/13/1996

METSAT UNIQUE

Connector, PCB	Ref/Qty	Description	Failure Rate	λb	πK	πP	πE
1337748-1	P1	Connector	0.00154	0.00028	1.5	7.22282	0.5

Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty	Description	Failure Rate	λb	πC	πQ	πE	N1	N2
1337312-1	1	PWB, Parallel to Ser Cnvtr	0.06521	1.7E-05	1.55672	1	0.5	0	527

Total Failure Rate: 0.09153

TABLE A2ES-METSAT-9(Cont.)

METSAT UNIQUE

Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Compl.	Tech.	Ea	Junct. Temp.	Watts	θjc (°C/W)	Active Pins	Years Mfr	Package	Quality
25012/03-1	U1	3-to-8 Line Decoder	32	Digital	0.35	35.13	0.0105	12	16	>2	Hermetic	S
25012/02-1	U2-U5	8-Bit I/O Port	46	Digital	0.35	35.16	0.0105	15.1	24	>2	Hermetic	S
25012/10-2	U6, U7	Parallel FIFO (1K x 9)	9000	Digital	0.35	37.80	0.35	8	28	>2	Hermetic	S
M38510H05754SEX	U8, U9	8-Stage Static Shift Register	25	Digital	0.35	35.18	0.009	20	16	>2	Hermetic	S
M38510H05553SEX	U10	Hex Inverter	6	Digital	0.35	35.32	0.016	20	14	>2	Hermetic	S
26043-8	U11	Hex Inverter (Schmitt Trig.)	3	Digital	0.35	35.18	0.009	20	14	>2	Hermetic	S
M38510H05554SEX	U12	Hex Buffer	3	Digital	0.35	35.32	0.016	20	14	>2	Hermetic	S
M38510H05151SCX	U13	Dual 'D' Flip-Flop	16	Digital	0.35	35.18	0.009	20	14	>2	Hermetic	S
M38510R17001SCX	U14	Quad AND	5	Digital	0.35	35.18	0.009	20	14	>2	Hermetic	S
M38510H17101SCX	U15	Quad OR	10	Digital	0.35	35.18	0.009	20	14	>2	Hermetic	S
25012/13-1	U17	Hex Buffer	6	Digital	0.35	35.48	0.024	20	16	>2	Hermetic	S

Resistors, Fixed, Composition

Part Number	Ref/Qty	Description	Ohms	Rated Power	Actual Power	Quality
RCR07G104JS	R1-R17	Est. Rel., 100K, 0.25W	100000	0.25	0.00005	S
RCR07G511JS	R19, R20	Est. Rel., 510, 0.25W	510	0.25	0.0098	S

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Ohms	Rated Power	Actual Power	Quality
RNC60E1651FS	R18, R23	1.65K, 1%, 0.125W	1650	0.125	0.00303	S
RNC55J3161FS	R21	3.16K, 1%, 0.1W	3160	0.1	0.00158	S
RNC55J1781FS	R22	1.78K, 1%, 0.1W	1780	0.1	0.00281	S
RNC55J4022FS	R24	40.2K, 1%, 0.1W	40200	0.1	0.00012	S

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	pF	Rated Temp.	Rated Voltage	Actual Voltage	Quality
M123A02BPC391FC	C1, C6	Est. Rel., 0.1uF, 100V	390	85	100	5	S
M39014/01-1339	C2, C3	Est. Rel., 100pF, 200V	100	85	200	5	S
M39014/01-1329	C4	Est. Rel., 27pF, 200V	27	85	200	5	S
M123A02BXB104KC	C8, C11-C19	Est. Rel., 0.1uF, 100V	100000	85	100	5	S
M39014/01-1575	C9, C10	Est. Rel., 0.1uF, 100V	100000	85	100	5	S

Capacitors, Fixed, Electrolytic, Tantalum

Part Number	Ref/Qty	Description	uF	Rated Temp.	Rated Voltage	Actual Voltage	Quality
M39003/01-8209	C7	Est. Rel., 3.3uF, 50V	3.3	85	50	5	S

TABLE A2ES-METSAT-9(Cont.)

METSAT.XLS
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METSAT UNIQUE

Connector, PCB	Ref/Qty	Description	*Active Pins*	*Pin Gauge*	*Avg. Current*	*Temp. Rise*	*Quality*	*Mate / Unmate per 1000 hours*
1337748-1	P1	Connector	*39*	*26*	*0.1*	*0.03*	*Mil*	*0.5*

Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty	Description	*Layers*	*Quality*	*Wave Solder*	*Hand Solder*
1337312-1	1	PWB, Parallel to Ser Cnvtr	*4*	*Mil*	*PTHs->*	*527*

TABLE A2ES-METSAT-10

METSAT UNIQUE

Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Failure Rate	πT	πE	πQ	πL	C1	C2
AS8322/30302SCA	U1	Triple 3-Input NOR	0.00117	0.2275	0.5	0.25	1	0.01	0.0048
AS8322/11005SCX	U2	Quadruple Op. Amp.	0.00117	0.2275	0.5	0.25	1	0.01	0.0048
AS8322/11404SGX	U8, U9	JFET Input Op. Amp.	0.00151	0.2275	0.5	0.25	1	0.01	0.0015

Diodes

Part Number	Ref/Qty	Description	Failure Rate	λb	πT	πS	πC	πQ	πE
AS8301-1N41481S	CR1, CR2, CR7	Switching Diode	0.00008	0.001	1.4004	0.054	1	0.7	0.5
AS8301-1N41481S	CR3, CR8	Switching Diode	0.00005	0.001	1.4004	0.054	1	0.7	0.5
AS8301-1N41481S	CR4,CR6,CR9,CR11	Switching Diode	0.00011	0.001	1.4004	0.054	1	0.7	0.5
AS8301-1N41481S	CR5, CR10	Switching Diode	0.00005	0.001	1.4004	0.054	1	0.7	0.5
AS8301-1N41481S	CR12, CR13	Switching Diode	0.00005	0.001	1.4004	0.054	1	0.7	0.5
AS8301-1N41481S	CR14, CR15	Switching Diode	0.00005	0.001	1.4004	0.054	1	0.7	0.5
AS8301-1N41481S	CR16 (-1 only)	Switching Diode	0.00003	0.001	1.4004	0.054	1	0.7	0.5
AS8301-1N41481S	CR17, CR18	Switching Diode	0.00005	0.001	1.4004	0.054	1	0.7	0.5
AS8301-1N5417-S	CR19, CR20	Switching Diode	0.00009	0.001	1.4004	0.0912	1	0.7	0.5
AS8301-1N759A1S	VR1	Zener Diode, Vz=12.0	0.00086	0.002	1.2333	1	1	0.7	0.5

Transistors, Low Frequency, Bipolar

Part Number	Ref/Qty	Description	Failure Rate	λb	πT	πA	πR	πS	πQ	πE
AS8302-2N2222AS	Q1, Q3, Q5, Q7	NPN General Purpose	0.00024	0.0007	1.6968	0.7	0.7125	0.2745	0.7	0.5
AS8302-2N2222AS	Q2, Q4, Q6, Q8	NPN General Purpose	0.00024	0.0007	1.6968	0.7	0.7125	0.2745	0.7	0.5
AS8302-2N2222AS	Q9, Q10, Q11	NPN General Purpose	0.00012	0.0007	1.6968	0.7	0.7125	0.2745	0.7	0.5
AS8302-2N2222AS	Q11 (-1 only)	NPN General Purpose	0.00006	0.0007	1.6968	0.7	0.7125	0.2745	0.7	0.5
AS8302-2N2222AS	Q12	NPN General Purpose	0.00006	0.0007	1.6968	0.7	0.7125	0.2745	0.7	0.5
AS8302-2N2907AS	Q13, Q14	PNP General Purpose	0.00010	0.0007	1.6018	0.7	0.6560	0.2745	0.7	0.5
AS8302-2N2907AS	Q15, Q17	PNP General Purpose	0.00010	0.0007	1.6018	0.7	0.6560	0.2745	0.7	0.5
AS8302-2N2907AS	Q16, Q18	PNP General Purpose	0.00010	0.0007	1.6018	0.7	0.6560	0.2745	0.7	0.5

Optoelectronics

Part Number	Ref/Qty	Description	Failure Rate	λb	πT	πQ	πE
26045-1	U3, U4	Optical Coupler	0.00007	0.013	0.0003	0.7	13
26045-1	U5, U6	Optical Coupler	0.00007	0.013	0.0003	0.7	13
26045-1	U7 (-1 only)	Optical Coupler	0.00003	0.013	0.0003	0.7	13

Resistors, Fixed, Composition

Part Number	Ref/Qty	Description	Failure Rate	λb	πR	πQ	πE
RCR05G102JS	R1, R5	1K, 0.125W, Est. Rel.	0.00001	0.0006	1	0.03	0.2
RCR05G102JS	R2, R4, R6, R8	1K, 0.125W, Est. Rel.	0.00002	0.0006	1	0.03	0.2
RCR05G102JS	R3, R7	1K, 0.125W, Est. Rel.	0.00001	0.0006	1	0.03	0.2
RCR05G102JS	R9, R10	1K, 0.125W, Est. Rel.	0.00001	0.0007	1	0.03	0.2

TABLE A2ES-METSAT-10 (Cont.)

METSAT UNIQUE

RCR05G104JS	R11, R13, R15, R17	100K, 0.125W, Est. Rel.	0.00002	0.0006	1.1	0.03	0.2
RCR05G104JS	R12, R14, R16, R18	100K, 0.125W, Est. Rel.	0.00002	0.0006	1.1	0.03	0.2
RCR05G512JS	R19, R20	5.1K, 0.125W, Est. Rel.	0.00001	0.0007	1	0.03	0.2
RCR05G512JS	R21	5.1K, 0.125W, Est. Rel.	3.9E-06	0.0006	1	0.03	0.2
RCR05G512JS	R22	5.1K, 0.125W, Est. Rel.	3.9E-06	0.0006	1	0.03	0.2
RCR05G512JS	R23	5.1K, 0.125W, Est. Rel.	3.9E-06	0.0006	1	0.03	0.2
RCR05G512JS	R24 (-1 only)	5.1K, 0.125W, Est. Rel.	3.9E-06	0.0006	1	0.03	0.2
RCR05G103JS	R25, R26	10K, 0.125W, Est. Rel.	0.00001	0.0007	1	0.03	0.2
RCR05G103JS	R27	10K, 0.125W, Est. Rel.	3.9E-06	0.0006	1	0.03	0.2
RCR05G103JS	R28	10K, 0.125W, Est. Rel.	3.9E-06	0.0006	1	0.03	0.2
RCR05G103JS	R29	10K, 0.125W, Est. Rel.	3.9E-06	0.0006	1	0.03	0.2
RCR05G103JS	R30	10K, 0.125W, Est. Rel.	3.9E-06	0.0006	1	0.03	0.2
RCR05G103JS	R31 (-1 only)	10K, 0.125W, Est. Rel.	3.9E-06	0.0006	1	0.03	0.2
RCR05G101JS	R32	100, 0.125W, Est. Rel.	3.9E-06	0.0006	1	0.03	0.2
RCR05G101JS	R33	100, 0.125W, Est. Rel.	3.9E-06	0.0006	1	0.03	0.2
RCR05G101JS	R34-R37	100, 0.125W, Est. Rel.	0.00002	0.0006	1	0.03	0.2
RCR20G202JS	R38	2K, 0.5W, Est. Rel.	0.00001	0.0009	1	0.03	0.2
RCR05G202JS	R39, R40	2K, 0.125W, Est. Rel.	0.00001	0.0007	1	0.03	0.2
RCR05G202JS	R41 (-1 only)	2K, 0.125W, Est. Rel.	4.0E-06	0.0007	1	0.03	0.2
RCR05G202JS	R42, R43	2K, 0.125W, Est. Rel.	0.00001	0.0006	1	0.03	0.2
RCR05G106JS	R44, R45	10M, 0.125W, Est. Rel.	0.00002	0.0006	2.5	0.03	0.2

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Failure Rate	λb	πR	πQ	πE
RNC50J1002FS	R46, R48	10K, 0.05W	0.00001	0.0006	1	0.03	0.2
RNC50J1002FS	R47, R49	10K, 0.05W	0.00001	0.0006	1	0.03	0.2
RNC50J2002FS	R50, R51	10K, 0.05W	0.00001	0.0006	1	0.03	0.2
RNC50J1003FS	R52, R53	100K, 0.05W	0.00001	0.0006	1.1	0.03	0.2
RNC55J2263FS	R54, R55	226K, 0.1W	0.00001	0.0006	1.1	0.03	0.2
RNC55J2803FS	R56, R57	280K, 0.1W	0.00001	0.0006	1.1	0.03	0.2
RNC55J1004FS	R58, R59	1M, 0.1W	0.00001	0.0006	1.6	0.03	0.2
RNC50J2002FS	R60, R63	10K, 0.05W	0.00001	0.0006	1	0.03	0.2
RNC50J2002FS	R61, R62	10K, 0.05W	0.00001	0.0006	1	0.03	0.2

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	Failure Rate	λb	πCV	πQ	πE
M123A02BXC104KC	C7-C12	0.1uF, 100V, Est. Rel.	0.00008	0.0007	1.4547	0.03	0.4

Capacitors, Fixed, Electrolytic, Tantalum, Solid

Part Number	Ref/Qty	Description	Failure Rate	λb	πCV	πSR	πQ	πE
M39003/01-8194	C1	1.0uF, 50V, Est. Rel.	0.00002	0.0048	1	0.33	0.03	0.4
M39003/01-8194	C2, C3	1.0uF, 50V, Est. Rel.	0.00004	0.0047	1	0.33	0.03	0.4

TABLE A2ES-METSAT-10 (Cont.)

METSAT UNIQUE

M39003/01-8194	C4	1.0uF, 50V, Est. Rel.	0.00002	0.0057	1	0.33	0.03	0.4
M39003/01-8282	C5, C6	3.3uF, 75V, Est. Rel.	0.00008	0.0085	1.1540	0.33	0.03	0.4
M39003/01-8078	C13, C14	10uF, 20V, Est. Rel.	0.00005	0.0047	1.3183	0.33	0.03	0.4

Connector, PCB	Ref/Qty	Description	Failure Rate	λb	πK	πP	πQ	πE
1337748-1	P1	Receptacle, 92-Contact	0.00171	0.0003	1.5	8.0119	0.5	

Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty	Description	Failure Rate	λb	πC	πQ	πE	N1	N2
1356911-1	1 (-1 Assembly)	PWB, Relay Drvr & Cur Mon	0.05307	1.7E-05	2.0098	1	0.5	0	416
1356911-1	1 (-2 Assembly)	PWB, Relay Drvr & Cur Mon	0.05167	1.7E-05	2.0098	1	0.5	0	405

-1 Failure Rate:	0.06183
-2 Failure Rate:	0.06030

TABLE A2ES-METSAT-10 (Cont.)

METSAT.XLS
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METSAT UNIQUE

Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Compl.	Tech.	Ea	Junct. Temp.	Actual Watts	θjc (°C/W)	Pins	Mfr Years	Package
AS8322/30302SCA	U1	Triple 3-Input NOR	32	Linear	0.65	35.00		20	14	2	Hermetic
AS8322/11005SCX	U2	Quadruple Op. Amp.	13	Linear	0.65	35.00			14	2	Hermetic
AS8322/11404SGX	U8, U9	JFET Input Op. Amp.	29	Linear	0.65	35.00		23	7	2	Can

Diodes

Part Number	Ref/Qty	Description	Contact	Type/App	Rated Voltage	Applied Voltage	Junct. Temp.	Actual Watts	θjl (°C/W)	Case	Quality
AS8301-1N41481S	CR1, CR2, CR7	Switching Diode	Metal	Switch	75		35.00		120	DO-35	JANTXV
AS8301-1N41481S	CR3, CR8	Switching Diode	Metal	Switch	75		35.00		120	DO-35	JANTXV
AS8301-1N41481S	CR4,CR6,CR9,CR11	Switching Diode	Metal	Switch	75		35.00		120	DO-35	JANTXV
AS8301-1N41481S	CR5, CR10	Switching Diode	Metal	Switch	75		35.00		120	DO-35	JANTXV
AS8301-1N41481S	CR12, CR13	Switching Diode	Metal	Switch	75		35.00		120	DO-35	JANTXV
AS8301-1N41481S	CR14, CR15	Switching Diode	Metal	Switch	75		35.00		120	DO-35	JANTXV
AS8301-1N41481S	CR16 (-1 only)	Switching Diode	Metal	Switch	75		35.00		120	DO-35	JANTXV
AS8301-1N41481S	CR17, CR18	Switching Diode	Metal	Switch	75		35.00		120	DO-35	JANTXV
AS8301-1N5417-S	CR19, CR20	Switching Diode	Metal	Switch	75	28	35.00		10	DO-35	JANTXV
AS8301-1N759A1S	VR1	Zener Diode, Vz=12.0	Metal	V. Ref.	-	-	35.00		200	DO-35	JANTXV

Transistors, Low Frequency, Bipolar

Part Number	Ref/Qty	Description	Case	θjc (°C/W)	Junct. Temp.	Rated Power	Actual Power	Rated Vceo	VCE Applied	Appl. (Lin/Sw)	Quality
AS8302-2N2222AS	Q1, Q3, Q5, Q7	NPN General Purpose	TO-18	70	49.00	0.4	0.2	60	35	Sw	JANTXV
AS8302-2N2222AS	Q2, Q4, Q6, Q8	NPN General Purpose	TO-18	70	49.00	0.4	0.2	60	35	Sw	JANTXV
AS8302-2N2222AS	Q9, Q10, Q11	NPN General Purpose	TO-18	70	49.00	0.4	0.2	60	35	Sw	JANTXV
AS8302-2N2222AS	Q11 (-1 only)	NPN General Purpose	TO-18	70	49.00	0.4	0.2	60	35	Sw	JANTXV
AS8302-2N2222AS	Q12	NPN General Purpose	TO-18	70	49.00	0.4	0.2	60	35	Sw	JANTXV
AS8302-2N2907AS	Q13, Q14	PNP General Purpose	TO-18	70	46.20	0.32	0.16	60	35	Sw	JANTXV
AS8302-2N2907AS	Q15, Q17	PNP General Purpose	TO-18	70	46.20	0.32	0.16	60	35	Sw	JANTXV
AS8302-2N2907AS	Q16, Q18	PNP General Purpose	TO-18	70	46.20	0.32	0.16	60	35	Sw	JANTXV

Optoelectronics

Part Number	Ref/Qty	Description	θjc (°C/W)	Junct. Temp.	Rated Power	Actual Power	Package	Quality
26045-1	U3, U4	Optical Coupler	70	35.35	0.196	0.005	TO-99	JANTXV
26045-1	U5, U6	Optical Coupler	70	35.35	0.196	0.005	TO-99	JANTXV
26045-1	U7 (-1 only)	Optical Coupler	70	35.35	0.196	0.005	TO-99	JANTXV

Resistors, Fixed, Composition

Part Number	Ref/Qty	Description	Ohms	Rated Power	Actual Power	Quality
RCR05G102JS	R1, R5	1K, 0.125W, Est. Rel.	1000	0.125		S
RCR05G102JS	R2, R4, R6, R8	1K, 0.125W, Est. Rel.	1000	0.125		S
RCR05G102JS	R3, R7	1K, 0.125W, Est. Rel.	1000	0.125		S
RCR05G102JS	R9, R10	1K, 0.125W, Est. Rel.	1000	0.125	0.005	S

TABLE A2ES-METSAT-10 (Cont.)

METSAT UNIQUE

RCR05G104JS	R11, R13, R15, R17	100K, 0.125W, Est. Rel.	*100000*	*0.125*		S
RCR05G104JS	R12, R14, R16, R18	100K, 0.125W, Est. Rel.	*100000*	*0.125*		S
RCR05G512JS	R19, R20	5.1K, 0.125W, Est. Rel.	*5100*	*0.125*	*0.0051*	S
RCR05G512JS	R21	5.1K, 0.125W, Est. Rel.	*5100*	*0.125*		S
RCR05G512JS	R22	5.1K, 0.125W, Est. Rel.	*5100*	*0.125*		S
RCR05G512JS	R23	5.1K, 0.125W, Est. Rel.	*5100*	*0.125*		S
RCR05G512JS	R24 (-1 only)	5.1K, 0.125W, Est. Rel.	*5100*	*0.125*		S
RCR05G103JS	R25, R26	10K, 0.125W, Est. Rel.	*10000*	*0.125*	*0.01*	S
RCR05G103JS	R27	10K, 0.125W, Est. Rel.	*10000*	*0.125*		S
RCR05G103JS	R28	10K, 0.125W, Est. Rel.	*10000*	*0.125*		S
RCR05G103JS	R29	10K, 0.125W, Est. Rel.	*10000*	*0.125*		S
RCR05G103JS	R30	10K, 0.125W, Est. Rel.	*10000*	*0.125*		S
RCR05G103JS	R31 (-1 only)	10K, 0.125W, Est. Rel.	*10000*	*0.125*		S
RCR05G101JS	R32	100, 0.125W, Est. Rel.	*100*	*0.125*		S
RCR05G101JS	R33	100, 0.125W, Est. Rel.	*100*	*0.125*		S
RCR05G101JS	R34-R37	100, 0.125W, Est. Rel.	*100*	*0.125*		S
RCR20G202JS	R38	2K, 0.5W, Est. Rel.	*2000*	*0.5*	*0.128*	S
RCR05G202JS	R39, R40	2K, 0.125W, Est. Rel.	*2000*	*0.125*	*0.0025*	S
RCR05G202JS	R41 (-1 only)	2K, 0.125W, Est. Rel.	*2000*	*0.125*	*0.0025*	S
RCR05G202JS	R42, R43	2K, 0.125W, Est. Rel.	*2000*	*0.125*		S
RCR05G106JS	R44, R45	10M, 0.125W, Est. Rel.	*1E+07*	*0.125*	*2.8E-06*	S

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	*Ohms*	*Rated Power*	*Actual Power*	*Quality*
RNC50J1002FS	R46, R48	10K, 0.05W	*10000*	*0.05*		S
RNC50J1002FS	R47, R49	10K, 0.05W	*10000*	*0.05*		S
RNC50J2002FS	R50, R51	10K, 0.05W	*20000*	*0.05*		S
RNC50J1003FS	R52, R53	100K, 0.05W	*100000*	*0.05*		S
RNC55J2263FS	R54, R55	226K, 0.1W	*226000*	*0.1*		S
RNC55J2803FS	R56, R57	280K, 0.1W	*280000*	*0.1*		S
RNC55J1004FS	R58, R59	1M, 0.1W	*1000000*	*0.1*		S
RNC50J2002FS	R60, R63	10K, 0.05W	*20000*	*0.05*		S
RNC50J2002FS	R61, R62	10K, 0.05W	*20000*	*0.05*		S

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	*pF*	*Rated Temp.*	*Rated Voltage*	*Actual Voltage*	*Quality*
M123A02BXC104KC	C7-C12	0.1uF, 100V, Est. Rel.	*100000*	*125*	*100*	*15*	S

Capacitors, Fixed, Electrolytic, Tantalum, Solid

Part Number	Ref/Qty	Description	*uF*	*Rated Temp.*	*Rated Voltage*	*Actual Voltage*	*Quality*
M39003/01-8194	C1	1.0uF, 50V, Est. Rel.	*1.0*	*85*	*50*	*5*	S
M39003/01-8194	C2, C3	1.0uF, 50V, Est. Rel.	*1.0*	*85*	*50*		S

TABLE A2ES-METSAT-10 (Cont.)

METSAT.XLS
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METSAT UNIQUE

M39003/01-8194	C4	1.0uF, 50V, Est. Rel.	*1.0*	*85*	*50*	*12*	*S*	
M39003/01-8282	C5, C6	3.3uF, 75V, Est. Rel.	*3.3*	*85*	*75*	*28*	*S*	
M39003/01-8078	C13, C14	10uF, 20V, Est. Rel.	*10*	*85*	*20*		*S*	

			Active	*Pin*	*Avg.*	*Temp.*		*Mate / Unmate*
Connector, PCB	Ref/Qty	Description	*Pins*	*Gauge*	*Current*	*Rise*	*Quality*	*per 1000 hours*
1337748-1	P1	Receptacle, 92-Contact	*43*	*26*	*0.1*	*0.03*	*Mil*	*0.5*

Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty	Description	*Layers*	*Quality*	*Wave Solder*	*Hand Solder*
1356911-1	1 (-1 Assembly)	PWB, Relay Drvr & Cur Mon	*6*	*Mil*	*PTHs->*	*416*
1356911-1	1 (-2 Assembly)	PWB, Relay Drvr & Cur Mon	*6*	*Mil*	*PTHs->*	*405*

Table A2ES-EOS Module A2 Electronics Subsystem (ES)

Nomenclature	Part Number	Quantity (n)	λ ($f/10^6$ hr)	nλ	λ Source/Remarks
DC-to-DC Converter	1356010-1	1	0.38243	0.38243	AE-26577
Detector/Preamp Assembly	1331300-1	1	0.04339	0.04339	Table A2ES-EOS-1
Power Control Monitoring Assy	1356760-1	1	0.28827	0.28827	Table A2ES-EOS-2 equals P/N 1356002. Other misc. has no reliability impact.
Cables					
Spacecraft Power (W1)	1356431-1	1	0.04440	0.04440	Table A2ES-EOS-21
Power In (W2)	1356432-1	1	0.08274	0.08274	Table A2ES-EOS-3
Scan Drive (W3)	1356433-1	1	0.06038	0.06038	Table A2ES-EOS-4
Clock and PRT (W4)	1356434-1	1	0.06382	0.06382	Table A2ES-EOS-5
Warm Load (W5)	1356816-1	1	0.012961	0.12961	Table A2ES-EOS-6
Extender (W6)	1356817-1	1	0.00204	0.00204	Table A2ES-EOS-22
Extender (W7)	1356818-1	1	0.00710	0.00710	Table A2ES-EOS-23
Extender (W8)	1356819-1	1	0.00241	0.00241	Table A2ES-EOS-24
Signal Processing Assembly (1356439-1)					
Temp Sensor "A" CCA	1338421	1	0.03278	0.03278	Table A2ES-EOS-7
Temp. Sensor Analog MUX CCA	1331688	1	0.00914	0.00914	Table A2ES-EOS-8
Analog MUX and A-D Converter CCA	1356418	1	0.03684	0.03684	Table A2ES-EOS-9
Integrate and Dump Filter CCA	1338424	1	0.01269	0.01269	Table A2ES-EOS-10
MIL-STD-1553 Interface CCA	1355998	1	0.15342	0.15342	Table A2ES-EOS-11
Timing Control CCA	1331135	1	0.02884	0.02884	Table A2ES-EOS-12
CPU CCA	1356413	1	0.02334	0.02334	Table A2ES-EOS-13
Memory CCA	1331126	1	0.01542	0.01542	Table A2ES-EOS-14
Scan Drive Electronics					
Scan Control Interface CCA	1331129	1	0.00731	0.00731	Table A2ES-EOS-15
MUX Relay CCA	1356000	1	0.02586	0.02586	Table A2ES-EOS-16
Interface/Converter CCA	1331697	1	0.03492	0.03492	Table A2ES-EOS-17
Resolver-Data Isolator CCA	1334972	1	0.01716	0.01716	Table A2ES-EOS-18
R-D Converter/Oscillator CCA	1337739	1	0.08332	0.08332	Table A2ES-EOS-19
Motor Driver CCA	1331694-2	1	0.03874	0.03874	Table A2ES-EOS-20

Total A2ES-EOS λ = 1. 62637

TABLE A2ES-EOS-1

Environment: SF

Temperature: 30°C

Part Number	Description	Failure Rate A2	Failure Rate Unit	
1331074-3	CCA, 2-Channel Video Preamp	1	0.01166	0.01166
1331577-2	Detector, RF	2	0.01765	0.03530
AS8052-1	Connector	2	0.008	0.016
AS8385-55-3007	SMA Connectors	2	0.003	0.006
AS8137-2A204	Connector	2	0.008	0.016
311P10-2P-C-15	Connecor	2	0.008	0.016

A2 Module: 0.04696

TABLE A2ES-EOS-2

Environment: SF

Temperature: 30°C

Part Number	Description		Failure Rate Unit	
1356002	CCA, Power Control/Monitoring	1	0.28827	0.28827
MS27742-1	Relay	2	0.0133	0.0267
311P10-4P-C-12	Connector	1	0.008	0.008
AS8324-05-S	Filter	14	0.096	1.344

Total Failure Rate: 0.31493

Part Number: 1356760

Power Control/Monitor Assembly

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TABLE A2ES-EOS-2

Diodes, Low Frequency

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠT	ΠS	ΠC	ΠQ	ΠE
JANS1N6642	CR1 - CR16	Switching Diode	0.00262	0.001	1.61815	0.289006	1	0.7	0.5
1N759A-1	VR1 - VR6	Diode, Zener	0.00259	0.001	1.233347	1	1	0.7	0.5

Optoelectronics

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠT	ΠQ	ΠE
JANS4N49	U1 - U4	Optical Isolator	5.32E-06	0.013	0.000292	0.7	0.5

Transistors, Low Frequency, Bipolar

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠT	ΠA	ΠR	ΠS	ΠQ	ΠE
JANS2N2222A	Q3, Q6	NPN General Purpose	0.00027	0.00074	5.383425	0.7	0.712463	0.191202	0.7	0.5

Transistors, Low Frequency, Si FET

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠT	ΠA	ΠQ	ΠE
JANS2N7272H	Q1, Q2, Q4, Q5	FET, Power	0.26370	0.012	3.924108	4	0.7	0.5

Resistors, Fixed, Composition, Established Reliability

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠR	ΠQ	ΠE
RCR05G203JS	R1, R2, R10, R20	20K, 0.125W, 5%	3.29E-05	0.000548	1	0.03	0.5
RCR05G392JS	R3, R4, R14, R15	3.9K, 0.125W, 1%	3.29E-05	0.000548	1	0.03	0.5
RCR05G222JS	R9, R17	2.2K, 0.125W, 1%	1.64E-05	0.000548	1	0.03	0.5

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠR	ΠQ	ΠE
RLR051001FS	R6, R12	1K, 1%, 0.125W	9.43E-06	0.000786	1	0.03	0.2
RLR052001FS	R7, R13	2K, 1%, 0.125W	1.68E-05	0.001398	1	0.03	0.2
RLR05C1102FS	R32	11K, 1%, 0.125W	3.90E-06	0.00065	1	0.03	0.2
RLR05C1302FS	R33	13K, 1%, 0.125W	4.39E-06	0.000731	1	0.03	0.2
RLR0C8061FS	R34	8.06K, 1%, 0.125W	4.14E-06	0.00069	1	0.03	0.2
RLR05C1822FS	R35	18.2K, 1%, 0.25W	4.83E-06	0.000805	1	0.03	0.2
RLR05C3011FS	R36	3.01K, 1%, 0.25W	4.83E-06	0.000805	1	0.03	0.2
RLR05C1212FS	R37, R38	12.1K, 1%, 0.125W	7.94E-06	0.000662	1	0.03	0.2

TABLE A2ES-EOS-2 (Cont.)

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Resistors, Network, Fixed, Film

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠT	ΠNR	ΠQ	ΠE
M8340101H1212FB	RN1	12.1K, 0.125W	0.00154	0.00006	4.661371	11	1	0.5
M8340101H1302FB	RN2	13K, 0.125W	0.00112	0.00006	4.661371	8	1	0.5

Resistors, Fixed, Wirewound, Power

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠR	ΠQ	ΠE
RWR80S1R00FS	R25	1 ohm, 2W, 1%	0.00014	0.015764	1	0.03	0.3
RWR80S1R50FS	R22-R24, R29-R31	1.5 ohm, 2W, 1%	0.00085	0.015764	1	0.03	0.3
RWR80SR332FS	R8	0.332 ohm, 2W, 1%	0.00014	0.015764	1	0.03	0.3
RWR80S2R00FS	R18	2 ohm, 2W, 1%	0.00014	0.015764	1	0.03	0.3
1331073-1	R19-R21, R26-R28	Kit, 2W, 1%	0.00085	0.015764	1	0.03	0.3

Connector, PCB

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠK	ΠP	ΠE
M83513/16-FOINP	J1	37 Pin	0.00112	0.000285	1.5	5.262599	0.5
M24308/23-39	J2	25 Pin	0.00099	0.000285	1.5	4.618523	0.5
	J3	37 Pin	0.00086	0.000285	1.5	4.00623	0.5
M83513/16-DOINP	J4	25 Pin	0.00064	0.000285	1.5	2.996881	0.5
M83513/19-AOINP	J5	9 Pin	0.00037	0.000285	1.5	1.717296	0.5
M83513/17-GOINP	J6	51 Pin	0.00142	0.000285	1.5	6.658756	0.5

Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠC	ΠQ	ΠE	N1	N2
1356422-1	1	Printed Wiring Board	0.00877	1.7E-05	1.791697	1	0.5	576	0

Total Failure Rate: 0.28827

TABLE A2ES-EOS-2 (Cont.)

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Diodes, Low Frequency				Rated	Applied	Junct.		qjc		
Part Number	Ref/Qty	Contact	Type/App	Voltage	Voltage	Temp.	Watts	(°C/W)	Case	Quality
JANS1N6642	CR1 - CR16	Metal	Switch	75	45	39.5	0.45	10	DO-35	JANTXV
1N759A-1	VR1 - VR6	Metal	V. Ref.	40	24	35		70	TO-18	JANTXV

Optoelectronics		qjc	Junct.	Rated	Actual			
Part Number	Ref/Qty	(°C/W)	Temp.	Power	Power	Package	Quality	
JANS4N49	U1 - U4	70	51.8	0.4	0.24	TO-99	JANTXV	

Transistors, Low Frequency, Bipolar		qjc	Junct.	Rated	Actual	Rated	Vce	Appl.		
Part Number	Ref/Qty	(°C/W)	Temp.	Power	Power	Vceo	Applied	(Lin/Sw)	Case	Quality
JANS2N2222A	Q3, Q6	70	117.71	0.4	1.1816	60	28	Sw	TO-18	JANTXV

Transistors, Low Frequency, Si FET				qjc	Junct.	Rated	Actual		
Part Number	Ref/Qty	Appl.	Type	(°C/W)	Temp.	Power	Power	Case	Quality
JANS2N7272H	Q1, Q2, Q4, Q5	Power	MOS	70	105	25	1	TO-205	JANTXV

Resistors, Fixed, Composition, Establish Relia			Rated	Actual	
Part Number	Ref/Qty	Ohms	Power	Power	Quality
RCR05G203JS	R1, R2, R10, R20	20000	0.125	0.075	S
RCR05G392JS	R3, R4, R14, R15	3900	0.125	0.075	S
RCR05G222JS	R9, R17	2200	0.125	0.075	S

Resistors, Fixed, Film			Rated	Actual	
Part Number	Ref/Qty	Ohms	Power	Power	Quality
RLR051001FS	R6, R12	1000	0.125	0.0218	S
RLR052001FS	R7, R13	2000	0.125	0.075	S
RLR05C1102FS	R32	11000	0.125	0.0004	S
RLR05C1302FS	R33	13000	0.1	0.0016	S
RLR0C8061FS	R34	8060	0.125	0.0072	S
RLR05C1822FS	R35	18200	0.25	0.049	S
RLR05C3011FS	R36	3010	0.25	0.049	S
RLR05C1212FS	R37, R38	12100	0.25	0.005	S

TABLE A2ES-EOS-2 (Cont.)

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Resistors, Network, Fixed, Film			Rated	Actual	
Part Number	Ref/Qty	Ohms	Power	Power	Quality
M8340101H1212FB	RN1	12100	0.125	0.075	Mil
M8340101H1302FB	RN2	13000	0.125	0.075	Mil

Resistors, Fixed, Wirewound, Power			Rated	Actual	
Part Number	Ref/Qty	Ohms	Power	Power	Quality
RWR80S1R00FS	R25	1	2	1.2	S
RWR80S1R50FS	R22-R24, R29-R31	1.5	2	1.2	S
RWR80SR332FS	R8	0.332	2	1.2	S
RWR80S2R00FS	R18	2	2	1.2	S
1331073-1	R19-R21, R26-R28	10	2	1.2	S

Connector, PCB		Active	Pin	Avg.	Temp.		Mate / Unmate
Part Number	Ref/Qty	Pins	Gauge	Current	Rise	Quality	per 1000 hours
M83513/16-FOINP	J1	28	26	0.1	0.03	Mil	0.5
M24308/23-39	J2	24	26	0.1	0.03	Mil	0.5
	J3	20	26	0.1	0.03	Mil	0.5
M83513/16-DOINP	J4	13	26	0.1	0.03	Mil	0.5
M83513/19-AOINP	J5	4	26	0.1	0.03	Mil	0.5
M83513/17-GOINP	J6	36	26	0.1	0.03	Mil	0.5

Interconnection Assemblies with Plated Through						
Part Number	Ref/Qty	Layers	Quality		Wave Solder	Hand Solder
1356422-1	1	5	Mil	PTHs->	576	0

TABLE A2ES-EOS-3

EOS Part Number 1356432-1

Item No.	Qty Reqd	Part Number	Nomenclature	Designation	Active Pins
1	1	1337653-2	CCA, I/O Interface	P324	39
2	1	AS8096-25PLR0	Connector	P902	23
3	1	AS8381-04-G04NA	Connector, 51 Pin, 26AWG Wire	P706	16

Designation	λp	λb	πK	πP	πE	πQ	i_{AVG}	ΔT	AWG
P324 Connector	0.00103	0.00057	1.0	7.22	0.50		0.1	0.01397	22
Connections	0.0507	0.0026			0.50	1.0			*Hand Solder, w/o Wrapping*
P902 Connector	0.00063	0.00057	1.0	4.46	0.50		0.1	0.01397	22
Connections	0.0299	0.0026			0.50	1.0			*Hand Solder, w/o Wrapping*
P706 Connector	0.00049	0.00057	1.0	3.42	0.50		0.1	0.01397	22
Connections	0.00208	0.00026			0.50	1.0			*Crimp*
	0.08274								

METSAT Part Number 1357147

Item No.	Qty Reqd	Part Number	Nomenclature	Designation	Active Pins
1	1	1337653-2	CCA, I/O Interface	P324	39
2	1	AS8096-25PLR0	Connector	P902	23
3	1	AS8381-04-G04NA	Connector, 51 Pin, 26AWG Wire	P706	16

Designation	λp	λb	πK	πP	πE	πQ	i_{AVG}	ΔT	AWG
P324 Connector	0.00103	0.00057	1.0	7.22	0.50		0.1	0.01397	22
Connections	0.0507	0.0026			0.50	1.0			*Hand Solder, w/o Wrapping*
P902 Connector	0.00063	0.00057	1.0	4.46	0.50		0.1	0.01397	22
Connections	0.0299	0.0026			0.50	1.0			*Hand Solder, w/o Wrapping*
P706 Connector	0.00049	0.00057	1.0	3.42	0.50		0.1	0.01397	22
Connections	0.00208	0.00026			0.50	1.0			*Crimp*
	0.08274								

TABLE A2ES-EOS-4

EOS Part Number 1356433-1

Item No.	Qty Reqd	Part Number	Nomenclature	Designation	Connections/Pins
1	1	1337653-3	CCA, I/O Interface	P325	33
2	1	1356784-2	Transistor Assy		33
3	1	311P409-3P-B-12	Connector, Sub-D	P702	13
4	1	AS8096-25SLRO	Connector, Sub-D	P101	20

Designation	λp	λb	πK	πP	πE	πQ	i_{AVG}	ΔT	AWG	
P325	0.00087	0.00057	1.0	6.12	0.50		0.1	0.01397	22	
	0.0429	0.0026			0.50	1.0				*Hand Solder, w/o Wrapping*
Transistor Assy	0.00901	(see assembly 1356784 failure rate calculations)								
Connections	0.00231	0.00014			0.50	1.0				*Hand Solder, w/ Wrapping*
P702	0.00043	0.00057	1.0	3.00	0.50		0.1	0.01397	22	
	0.00169	0.00026			0.50	1.0				*Crimp*
P101	0.00057	0.00057	1.0	4.01	0.50		0.1	0.01397	22	
	0.0026	0.00026			0.50	1.0				*Crimp*
	0.06038									

TABLE A2ES-EOS-5

EOS Part Number 1356434-1

Item No.	Qty Reqd	Part Number	Nomenclature	Designation	Pins/Connections
1	1	1337653-3	CCA, I/O Interface	P301	23
2	1	AS8096-9SHR0	Connector, 9 Skt, HF Filter	J3	6
3	1	AS8096-9PHR0	Connector, 9 Pin, HF Filter	J5	7
4	1	AS8096-37SHR0	Connector, 37 Skt, HF Filter	J4	11
7	4	RCR42G560JS	Resistor, 56Ω, (R-39008)	R1-R4	8

Designation	λp	λb	πK	πP	πE	πQ	i_{AVG}	ΔT	AWG	
P301 Connector	0.00063	0.00057	1.0	4.46	0.50		0.1	0.01397	22	
Connections	0.0299	0.0026			0.50	1.0				*Hand Solder, w/o Wrapping*
J3 Connector	0.00029	0.00057	1.0	2.02	0.50		0.1	0.01397	22	
Connections	0.0078	0.0026			0.50	1.0				*Hand Solder, w/o Wrapping*
Ground Lug	0.00026	0.00026			0.50	1.0				*Crimp*
J5 Connector	0.00031	0.00057	1.0	2.16	0.50		0.1	0.01397	22	
Connections	0.0091	0.0026			0.50	1.0				*Hand Solder, w/o Wrapping*
J4 Connector	0.00039	0.00057	1.0	2.72	0.50		0.1	0.01397	22	
Connections	0.0143	0.0026			0.50	1.0				*Hand Solder, w/o Wrapping*
Ground Lug	0.00026	0.00026			0.50	1.0				*Crimp*

						Watts	
	λp	λb	πR	πQ	πE	Rated	Actual
R1-R4	0.00003	0.00044	1.0	0.03	0.50	2	0.56
Connections	0.00056	0.00014		1.0	0.50		
	0.06382						

Hand Solder, w/ Wrapping

TABLE A2ES-EOS-6

EOS Part Number 1356816-1

Item No.	Qty Reqd	Part Number	Nomenclature	Designation	Active Pins
1	1	1337653-4	CCA, I/O Interface	P302	44
2	1	AS8096-37PHR0	Connector, 37Pin, HF Filter	J2	16
3	1	311P409-2S-B-12	Connector, Sub-D	P511	12
4	1	AS8096-24PLR0	Connector, 24 Pin, LF Filter	P102	18
5	1	AS8381-03-F04N	Connector w/26AWG Wire	P602	18
6	1	AS8381-03-A04N	Connector w/26AWG Wire	P705	4

Designation	λp	λb	πK	πP	πE	πQ	i_{AVG}	ΔT	AWG
P302 Connector	0.00117	0.00057	1.0	8.22	0.50		0.1	0.01397	22
Connections	0.0572	0.0026			0.50	1.0			*Hand Solder, w/o Wrapping*
J2 Connector	0.00049	0.00057	1.0	3.42	0.50		0.1	0.01397	22
Connections	0.0208	0.0026			0.50	1.0			*Hand Solder, w/o Wrapping*
P511 Connector	0.00041	0.00057	1.0	2.86	0.50		0.1	0.01397	22
Connections	0.00156	0.00026			0.50	1.0			*Crimp*
P102 Connector	0.00053	0.00057	1.0	3.71	0.50		0.1	0.01397	22
Connections	0.0234	0.0026			0.50	1.0			*Hand Solder, w/o Wrapping*
P602 Connector	0.00053	0.00057	1.0	3.71	0.50		0.1	0.01397	22
Connections	0.0234	0.0026			0.50	1.0			*Hand Solder, w/o Wrapping*
P705 Connector	0.00014	0.000070	1.0	3.71	0.50		0.1	0.01397	22
Connections	0.0052	0.0026			0.50	1.0			*Hand Solder, w/o Wrapping*
	0.12961								

TABLE A2ES-EOS-7

Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Failure Rate	ΠT	ΠE	ΠQ	ΠL	C1	C2
M38510/10104SGX	10	Operational Amplifier	0.00847	0.240917	0.5	0.25	1	0.01	0.00196
M38510/10104SGX	10	Operational Amplifier	0.00848	0.241222	0.5	0.25	1	0.01	0.00196
M38510/11404SGX	U21	Operational Amplifier	0.00113	0.353337	0.5	0.25	1	0.01	0.00196

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠR	ΠQ	ΠE
RNC90Y3K7400TR	10	Est. Rel., 3.74K, 0.3W	0.00016	0.000648	1	0.03	0.8
RNC90Y4K7000TR	10	Est. Rel., 4.70K, 0.3W	0.00016	0.000648	1	0.03	0.8
RNC90Y3K6500TR	10	Est. Rel., 3.65K, 0.3W	0.00016	0.000648	1	0.03	0.8
RNC90Y45K300TR	10	Est. Rel., 45.3K, 0.3W	0.00026	0.000648	1.7	0.03	0.8
RNC90Y1K0000TR	10	Est. Rel., 1.00K, 0.3W	0.00016	0.000648	1	0.03	0.8
RNC90Y45K300TR	10	Est. Rel., 45.3K, 0.3W	0.00026	0.000648	1.7	0.03	0.8
RNC90Y45K300TR	10	Est. Rel., 45.3K, 0.3W	0.00026	0.000648	1.7	0.03	0.8
RNC90Y45K300TR	10	Est. Rel., 45.3K, 0.3W	0.00026	0.000648	1.7	0.03	0.8
RNC90Y1K0000TR	R81	Est. Rel., 1.00K, 0.3W	2.60E-05	0.001081	1	0.03	0.8
RNC90Y123R00TR	R82	Est. Rel., 123, 0.3W	1.66E-05	0.00069	1	0.03	0.8
RNC90Y110R00TR	R83	Est. Rel., 110, 0.3W	1.57E-05	0.000655	1	0.03	0.8

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠCV	ΠQ	ΠE
M39014/01-1339	10	Est. Rel., 100pF, 200V	5.71E-05	0.000699	0.680431	0.03	0.4
M39014/01-1339	10	Est. Rel., 100pF, 200V	5.71E-05	0.000699	0.680431	0.03	0.4
M39014/01-1575	C33,C35	Est.Rel., 0.1 uF, 100V	2.44E-05	0.000699	1.454735	0.03	0.4

Capacitors, Fixed, Electrolytic, Tantalum, Solid

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠCV	PSR	ΠQ	ΠE
M39003/01-8073	20	Est. Rel., 2.2uF, 20V	0.00041	0.00469	1.099235	0.33	0.03	0.4
M39003/01-8111	C32	Est. Rel., 22uF, 50V	3.23E-05	0.005631	1.449075	0.33	0.03	0.4
M39003/01-8111	C34	Est. Rel., 22uF, 50V	6.07E-05	0.010571	1.449075	0.33	0.03	0.4

Connector, PCB	Ref/Qty	Description	Failure Rate	λb	ΠK	ΠP	ΠE
1337748-1	P1	Receptacle, 92-Contact	0.00378	0.000285	1.5	17.69336	0.5

TABLE A2ES-EOS-7 (Cont.)

Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠC	ΠQ	ΠE	N1	N2
1338422	1	Printed Wiring Board	0.00854	1.7E-05	2.009781	1	0.5	500	0

Total Failure Rate: 0.03278

TABLE A2ES-EOS-7 (Cont.)

Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Compl.	Tech.	Ea	Junct. Temp.	Watts	θjc (°C/W)	Pins	Mfr Years	Package	Quality
M38510/10104SGX	10	Operational Amplifier	29	Linear	0.65	35.72	0.0181	40	8	>2	Can	S
M38510/10104SGX	10	Operational Amplifier	29	Linear	0.65	35.74	0.0185	40	8	>2	Can	S
M38510/11404SGX	U21	Operational Amplifier	29	Linear	0.65	40.64	0.141	40	8	>2	Can	S

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Ohms	Rated Power	Actual Power	Quality
RNC90Y3K7400TR	10	Est. Rel., 3.74K, 0.3W	4190	0.1	0.000044	S
RNC90Y4K7000TR	10	Est. Rel., 4.70K, 0.3W	4700	0.1	0.00004	S
RNC90Y3K6500TR	10	Est. Rel., 3.65K, 0.3W	4650	0.1	0.00004	S
RNC90Y45K300TR	10	Est. Rel., 45.3K, 0.3W	45300	0.1	0.00004	S
RNC90Y1K0000TR	10	Est. Rel., 1.00K, 0.3W	204	0.1	0.000001	S
RNC90Y45K300TR	10	Est. Rel., 45.3K, 0.3W	45300	0.1	0.00004	S
RNC90Y45K300TR	10	Est. Rel., 45.3K, 0.3W	45300	0.1	0.000001	S
RNC90Y45K300TR	10	Est. Rel., 45.3K, 0.3W	45300	0.1	0.000001	S
RNC90Y1K0000TR	R81	Est. Rel., 1.00K, 0.3W	1000	0.1	0.0462	S
RNC90Y123R00TR	R82	Est. Rel., 123, 0.3W	123	0.1	0.0057	S
RNC90Y110R00TR	R83	Est. Rel., 110, 0.3W	100	0.1	0.001	S

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	pF	Rated Temp.	Rated Voltage	Actual Voltage	Quality
M39014/01-1339	10	Est. Rel., 100pF, 200V	100	85	200	1	S
M39014/01-1339	10	Est. Rel., 100pF, 200V	100	85	200	1	S
M39014/01-1575	C33,C35	Est.Rel., 0.1 uF, 100V	100000	85	100	0.1	S

Capacitors, Fixed, Electrolytic, Tantalum, Solid

Part Number	Ref/Qty	Description	uF	Rated Temp.	Rated Voltage	Actual Voltage	Quality
M39003/01-8073	20	Est. Rel., 2.2uF, 20V	2.2	85	20	0.5	S
M39003/01-8111	C32	Est. Rel., 22uF, 50V	22	85	35	8.2	S
M39003/01-8111	C34	Est. Rel., 22uF, 50V	22	85	35	15.1	S

Connector, PCB	Ref/Qty	Description	Active Pins	Pin Gauge	Avg. Current	Temp. Rise	Quality	Mate / Unmate per 1000 hours
1337748-1	P1	Receptacle, 92-Contact	80	26	0.1	0.03	Mil	0.5

Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty	Description	Layers	Quality	Wave Solder	Hand Solder
1338422	1	Printed Wiring Board	6	Mil	PTHs-> 500	0

TABLE A2ES-EOS-8

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Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Failure Rate	ΠT	ΠE	ΠQ	ΠL	C1	C2
26043-14	U1-U3	Analog Multiplexer	0.00858	0.15808	0.5	0.25	1	0.04	0.010235
M38510/10104SGX	U4, U5	Operational Amplifier	0.00158	0.24084	0.5	0.25	1	0.01	0.001499

Diodes, Low Frequency

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠT	ΠS	ΠC	ΠQ	ΠE
JANS1N4148-1	CR1	Switching Diode	0.00003	0.001	1.404984	0.054	1	0.7	0.5
26042-829-1	VR1	Zener Diode, 6.2V @ 7.5mA	0.00087	0.002	1.245022	1	1	0.7	0.5

Transistors, Low Frequency, Bipolar

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠT	ΠA	ΠR	ΠS	ΠQ	ΠE
26041-3700	Q1	Medium Power NPN	3.95E-06	0.00074	1.288711	0.7	0.273234	0.061831	0.7	0.5

Resistors, Fixed, Composition

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠR	ΠQ	ΠE
RCR07G473JS	R1	47K, 5%, 0.25W	4.34E-06	0.000723	1	0.03	0.2

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠR	ΠQ	ΠE
RNC50J82R2FS	R2	82.2 ohms, 1%, 0.05W	4.31E-06	0.000718	1	0.03	0.2
RNC50J1001FS	R3	1K, 1%, 0.05W	3.92E-06	0.000653	1	0.03	0.2
RNC50J1002FS	R4	10K, 1%, 0.05W	3.92E-06	0.000653	1	0.03	0.2
RNC55J1472FS	R7	14.7K, 1%, 0.05W	3.89E-06	0.000648	1	0.03	0.2

Resistors, Fixed, Wirewound, Power

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠR	ΠQ	ΠE
AS8089-14A	R5	22.6K, 1%, 0.1W	3.93E-06	0.000655	1	0.03	0.2
AS8089-14B	R6	45.3K, 1%, 0.1W	3.91E-06	0.000651	1	0.03	0.2
RWR81S1500FS	R8	150 ohms, 5%, 1W	0.00003	0.001128	1	0.03	0.8

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠCV	ΠQ	ΠE
M39014/01-1330	C1, C6	Est. Rel., 33pF, 200V	0.00001	0.000787	0.60231	0.03	0.4
M39014/01-1575	C2, C4	Est. Rel., 0.01uF, 100V	0.00002	0.001399	1.129234	0.03	0.4

TABLE A2ES-EOS-8 (Cont.)

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Capacitors, Fixed, Electrolytic, Tantalum, Solid

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠCV	ΠSR	ΠQ	ΠE
M39003/01-8111	C3, C5	Est. Rel., 22uF, 35V	0.00012	0.010455	1.449075	0.33	0.03	0.4

Connector, PCB	Ref/Qty	Description	Failure Rate	λb	ΠK	ΠP	ΠE
1337748-1	P1	Receptacle, 92-Contact	0.00344	0.000285	1.5	16.10043	0.5

Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty		Failure Rate	λb	ΠC	ΠQ	ΠE	N1	N2
1337641-1	1	Printed Wiring Board	0.00302	0.000017	1.556722	1	0.5	228	0

Total Failure Rate: 0.00914

TABLE A2ES-EOS-8 (Cont.)

SIG_PROC.XLS
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Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Compl.	Tech.	Ea	Junct. Temp.	Watts	θjc (°C/W)	Pins	Years Mfrd	Package	Quality
26043-14	U1-U3	Analog Multiplexer	421	Linear	0.35	35.36	0.018	20	28	>2	Hermetic	S
M38510/10104SGX	U4, U5	Operational Amplifier	29	Linear	0.65	35.72	0.018	40	7	>2	Can	S

Diodes, Low Frequency

Part Number	Ref/Qty	Description	Contact	Type/App	Rated Voltage	Applied Voltage	Junct. Temp.	Actual Watts	θjc (°C/W)	Case	Quality
JANS1N4148-1	CR1	Switching Diode	Metal	Switch	75	20	35.10	0.01	10	DO-35	JANTXV
26042-829-1	VR1	Zener Diode, 6.2V @ 7.5mA	Metal	V. Ref.	n/a	n/a	35.47	0.0465	10	DO-35	JANTXV

Transistors, Low Frequency, Bipolar

Part Number	Ref/Qty	Description	θjc (°C/W)	Junct. Temp.	Rated Power	Actual Power	Vce Applied	Rated Vceo	Appl. (Lin/Sw)	Case	Quality
26041-3700	Q1	Medium Power NPN	70	36.05	0.03	0.015	8.2	80		TO-18	JANTXV

Resistors, Fixed, Composition

Part Number	Ref/Qty	Description	Ohms	Quality	Rated Power	Actual Power
RCR07G473JS	R1	47K, 5%, 0.25W	47000	S	0.25	0.00143

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Ohms	Quality	Rated Power	Actual Power
RNC50J82R2FS	R2	82.2 ohms, 1%, 0.05W	82.2	S	0.05	0.00462
RNC50J1001FS	R3	1K, 1%, 0.05W	1000	S	0.05	0.00038
RNC50J1002FS	R4	10K, 1%, 0.05W	10000	S	0.05	0.00038
RNC55J1472FS	R7	14.7K, 1%, 0.05W	14700	S	0.1	5.88E-14

Resistors, Fixed, Wirewound, Power

Part Number	Ref/Qty	Description	Ohms	Quality	Rated Power	Actual Power
AS8089-14A	R5	22.6K, 1%, 0.1W	22600	S	0.1	0.00102
AS8089-14B	R6	45.3K, 1%, 0.1W	45300	S	0.1	0.00051
RWR81S1500FS	R8	150 ohms, 5%, 1W	150	S	1	0.5

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	pF	Quality	Rated Temp.	Rated Voltage	Actual Voltage
M39014/01-1330	C1, C6	Est. Rel., 33pF, 200V	33	S	85	200	30
M39014/01-1575	C2, C4	Est. Rel., 0.01uF, 100V	10000	S	85	100	30

Part Number: 1331688 **Analog Mux Temperature Circuit Card Assembly** Schematic: 1331689

TABLE A2ES-EOS-8 (Cont.)

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Capacitors, Fixed, Electrolytic, Tantalum, Solid

Part Number	Ref/Qty	Description	uF	Quality	Rated Temp.	Rated Voltage	Actual Voltage
M39003/01-8111	C3, C5	Est. Rel., 22uF, 35V	22	S	85	35	15

Connector, PCB	Ref/Qty	Description	Active Pins	Pin Gauge	Avg. Current	Temp. Rise	Quality	Mate / Unmate per 1000 hours
1337748-1	P1	Receptacle, 92-Contact	75	26	0.1	0.03	Mil	0.5

Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty		Layers	Quality		Wave Solder	Hand Solder
1337641-1	1	Printed Wiring Board	4	Mil	PTHs->	228	0

Total Failure Rate:

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TABLE A2ES-EOS-9

Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Failure Rate	ΠT	ΠE	ΠQ	ΠL	C1	C2
26149-1	U1	Voltage Regulator	0.00067	0.255	0.5	0.25	1	0.01	0.0003
26149-2	U2	Voltage Regulator	0.00077	0.2959	0.5	0.25	1	0.01	0.0003
26149-3	U3	2.5V Reference Diode	0.00062	0.2348	0.5	0.25	1	0.01	0.0003
26149-7	U4	Operational Amplifier	0.00084	0.2612	0.5	0.25	1	0.01	0.0015
26149-7	U5	Operational Amplifier	0.00084	0.2612	0.5	0.25	1	0.01	0.0015
26043-14	U6	16 Channel MUX/DeMUX	0.00175	0.1882	0.5	0.25	1	0.01	0.0102
26149-7	U7	Operational Amplifier	0.00077	0.2316	0.5	0.25	1	0.01	0.0015
26123-1	U8	16 Bit A/D Converter	0.00200	0.1882	0.5	0.25	1	0.0025	0.015
AS8083-08	U9	Hex Schmitt Trigger	0.00108	0.1882	0.5	0.25	1	0.01	0.0048
M38510/0525SCX	U10	Quad NOR Gate	0.00108	0.1882	0.5	0.25	1	0.01	0.0048

Diodes, Low Frequency

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠT	ΠS	ΠC	ΠQ	ΠE
JANS1N5615	CR1, CR2	Rectifier, Power	0.00024	0.069	9.2275	0.054	1	0.7	0.5
26042-4573A	CR3, CR4	Temp. Comp. Zener	2.62E-05	0.002	1.869	1	1	0.7	0.5
JANS1N4148-1	CR5	Switching Diode	1.36E-06	0.001	7.1924	0.054	1	0.7	0.5

Transistors, Low Frequency, Bipolar

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠT	ΠA	ΠR	ΠS	ΠQ	ΠE
JANS2N2222A	Q1, Q2, Q7	NPN General Purpose	3.10E-05	0.0007	1.4146	0.7	0.7125	0.1699	0.7	0.5
JANS2N2907A	Q3-Q6	PNP General Purpose	2.86E-05	0.0007	1.4146	0.7	0.656	0.1699	0.7	0.5
JANS2N2907A	Q8	PNP General Purpose	1.06E-05	0.0007	1.2738	0.7	0.656	0.0701	0.7	0.5
26041-3811	Q9	Dual Transistor (2N3811)	4.97E-05	0.0007	1.5836	0.7	0.5987	0.2891	0.7	0.5

Resistors, Fixed, Composition

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠR	ΠQ	ΠE
RCR05G101JS	R1, R2	Est. Rel., 100, 0.125W	4.32E-06	0.0007	1	0.03	0.2
RCR05G101JS	R3-R6	Est. Rel., 100, 0.125W	4.46E-06	0.0007	1	0.03	0.2
RCR05G102JS	R8, R24	Est. Rel., 1K, 0.125W	4.31E-06	0.0007	1	0.03	0.2
RCR05G104JS	R9	Est. Rel., 100K, 0.125W	4.74E-06	0.0007	1.1	0.03	0.2
RCR05G561JS	R10	Est. Rel., 560, 0.125W	4.38E-06	0.0007	1	0.03	0.2
RCR05G332JS	R11	Est. Rel., 3.3K, 0.125W	4.38E-06	0.0007	1	0.03	0.2
RCR05G100JS	R12	Est. Rel., 10, 0.125W	4.33E-06	0.0007	1	0.03	0.2
RCR05G100JS	R13, R14	Est. Rel., 10, 0.125W	4.33E-06	0.0007	1	0.03	0.2
RCR05G512JS	R15	Est. Rel., 5.1K, 0.125W	4.31E-06	0.0007	1	0.03	0.2
RCR05G133JS	R23	Est. Rel., 13K, 0.125W	4.79E-06	0.0008	1	0.03	0.2
RCR05G472JS	R34	Est. Rel., 4.7K, 0.125W	4.31E-06	0.0007	1	0.03	0.2

TABLE A2ES-EOS-9(Cont.)

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Resistors, Fixed, Composition

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠR	ΠQ	ΠE
RCR05G223JS	R21, R30, R30	Est. Rel., 22K, 0.125W	4.31E-06	0.0007	1	0.03	0.2
RCR05G163JS	R32, R33	Est. Rel., 16K, 0.125W	4.31E-06	0.0007	1	0.03	0.2
RCR05G222JS	R26, R35	Est. Rel., 2.2K, 0.125W	8.39E-06	0.0014	1	0.03	0.2
RCR05G103JS	R27	Est. Rel., 10K, 0.125W	8.39E-06	0.0014	1	0.03	0.2

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠR	ΠQ	ΠE
RLR05C4R75FS	R20	Est. Rel., 4.75, 0.125W	7.56E-06	0.0013	1	0.03	0.2
RLR05C6811FS	R28, R29	Est. Rel., 6.81K, 0.125W	1.51E-05	0.0013	1	0.03	0.2
RLR05C2000FS	R25	Est. Rel., 200, 0.125W	7.56E-06	0.0013	1	0.03	0.2
RNC55J1961FS	R7	Est. Rel., 1.96K. 0.1W	4.41E-06	0.0007	1	0.03	0.2
RNC55D7681FS	R16	Est. Rel., 7.68K, 0.1W	4.69E-06	0.0008	1	0.03	0.2
RNC55D7321FS	R17	Est. Rel., 7.32K, 0.1W	4.67E-06	0.0008	1	0.03	0.2
RNC55D2002FS	R18	Est. Rel., 20K, 0.1W	4.43E-06	0.0007	1	0.03	0.2
RNC55D2002FS	R19	Est. Rel., 20K, 0.1W	4.43E-06	0.0007	1	0.03	0.2
RNC55D6191FS	R20	Est. Rel., 6.19K, 0.1W	4.71E-06	0.0008	1	0.03	0.2
RNC55D8661FS	R21	Est. Rel., 8.66K, 0.1W	4.68E-06	0.0008	1	0.03	0.2
RNC55D2431FS	R22	Est. Rel, 2.43K, 0.1W	4.43E-06	0.0007	1	0.03	0.2

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠCV	ΠQ	ΠE
M39014/02-1350	C3-C8	Est. Rel., 0.1uF, 100V	7.57E-05	0.0007	1.4547	0.03	0.4
M39014/02-1350	C9-C14	Est. Rel., 0.1uF, 100V	6.76E-05	0.0006	1.4547	0.03	0.4
M39014/02-1347	C22	Est. Rel., 0.068uF, 100V	5.44E-06	0.0007	1.3943	0.03	0.4
M39014/01-1351	C23	Est.Rel., 470pF, 200V	6.22E-06	0.0006	0.8067	0.03	0.4
M123A01BXC102KC	C24	Est. Rel., 0.001uF, 100V	7.60E-06	0.0007	0.8766	0.03	0.4

Capacitors, Fixed, Electrolytic, Tantalum, Solid

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠCV	ΠQ	ΠE	PSR
M39003/01-8194	C1, C2, C25	Est. Rel., 1uF, 50V	2.52E-03	0.0067	5.2481	0.03	0.4	0.33
M39003/01-8024	C15-C21	Est. Rel., 4.7uF, 10V	6.30E-03	0.0138	6.319	0.03	0.4	0.33
M39003/01-3087	C26	Est. Rel., 3.9uF, 50V	4.33E-04	0.0058	6.1791	0.03	0.4	0.33

Connector, PCB	Ref/Qty	Description	Failure Rate	λb	ΠK	PP	ΠE
1337748-1	P1	Receptacle, 92-Contact	2.82E-03	0.0003	1.5	13.201	0.5

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TABLE A2ES-EOS-9(Cont.)

Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠC	ΠQ	ΠE	N1	N2
1337804	1	Printed Wiring Board	0.01366	4.00E-05	1.7917	1	0.5	372	0

Total Failure Rate: 0.03684

TABLE A2ES-EOS-9(Cont.)

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Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Compl.	Tech.	Ea	θjc (°C/W)	Junct. Temp.	Actual Power	Pins	Mfr Years	Package	Quality
26149-1	U1	Voltage Regulator	100	Linear	0.65	4	36.44	0.361	3	2	Can	S
26149-2	U2	Voltage Regulator	4	Linear	0.50	21	42.58	0.361	3	2	Can	S
26149-3	U3	2.5V Reference Diode	28	Linear	0.65	80	35.4	0.005	3	2	Can	S
26149-7	U4	Operational Amplifier	20	Linear	0.65	23	36.75	0.076	7	2	Can	S
26149-7	U5	Operational Amplifier	20	Linear	0.65	23	36.75	0.076	7	2	Can	S
26043-14	U6	16 Channel MUX/DeMUX	16	Digital	0.50	51	35	1.50E-05	28	2	Hermetic	S
26149-7	U7	Operational Amplifier	20	Linear	0.65	45	35.23	0.005	7	2	Can	S
26123-1	U8	16 Bit A/D Converter	16	Digital	0.50	28	35	1.50E-05	40	2	Hermetic	S
AS8083-08	U9	Hex Schmitt Trigger	1	Digital	0.50	28	35	1.50E-05	14	2	Hermetic	S
M38510/0525SCX	U10	Quad NOR Gate	4	Digital	0.5	28	35	0.005	14	2	Hermetic	S

Diodes, Low Frequency

Part Number	Ref/Qty	Description	Rated Voltage	Actual Voltage	θjc (°C/W)	Junct. Temp.	Rated Power	Actual Power	Case	Quality
JANS1N5615	CR1, CR2	Rectifier, Power	25	5.1	38	106.25	25	1.875		JANTXV
26042-4573A	CR3, CR4	Temp. Comp. Zener	n/a	n/a	38	44.12	0.4	0.24	DO-7	JANTXV
JANS1N4148-1	CR5	Switching Diode	100		50	95	2	1.2		JANTX /116

Transistors, Low Frequency, Bipolar

Part Number	Ref/Qty	Description	Case	θjc (°C/W)	Junct. Temp.	Rated Power	Actual Power	VCE Applied	Rated Vceo	Appl. (Lin/Sw	Quality
JANS2N2222A	Q1, Q2, Q7	NPN General Purpose	TO-18	70	40.32	0.4	0.076	15	35	Lin	JANTXV
JANS2N2907A	Q3-Q6	PNP General Purpose	TO-18	70	40.32	0.32	0.076	15	35	Lin	JANTXV
JANS2N2907A	Q8	PNP General Purpose	TO-18	70	35.53	0.32	0.0075	5	35	Lin	JANTXV
26041-3811	Q9	Dual Transistor (2N3811)	TO-77	71	45.65	0.25	0.15	36	60	Lin	JANTXV

Resistors, Fixed, Composition

Part Number	Ref/Qty	Description	Ohms	Rated Power	Actual Power	Quality
RCR05G101JS	R1, R2	Est. Rel., 100, 0.125W	100	0.125	0.0004	S
RCR05G101JS	R3-R6	Est. Rel., 100, 0.125W	100	0.125	0.004	S
RCR05G102JS	R8, R24	Est. Rel., 1K, 0.125W	1000	0.125	1.00E-06	S
RCR05G104JS	R9	Est. Rel., 100K, 0.125W	100000	0.125	1.00E-06	S
RCR05G561JS	R10	Est. Rel., 560, 0.125W	560	0.125	0.0018	S
RCR05G332JS	R11	Est. Rel., 3.3K, 0.125W	3300	0.125	0.0018	S
RCR05G100JS	R12	Est. Rel., 10, 0.125W	10	0.125	0.0006	S
RCR05G100JS	R13, R14	Est. Rel., 10, 0.125W	10	0.125	0.0006	S
RCR05G512JS	R15	Est. Rel., 5.1K, 0.125W	5100	0.125	0.00	S
RCR05G133JS	R23	Est. Rel., 13K, 0.125W	13000	0.125	0.012	S
RCR05G472JS	R34	Est. Rel., 4.7K, 0.125W	4700	0.125		S

Part Number: 1356418 **Analog Mux and A/D Converter Circuit Card Assembly** Schematic: 1356419

TABLE A2ES-EOS-9(Cont.)

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Resistors, Fixed, Composition

Part Number	Ref/Qty	Description	Ohms	Rated Power	Actual Power	Quality
RCR05G223JS	R21, R30, R30	Est. Rel., 22K, 0.125W	22000	0.125		S
RCR05G163JS	R32, R33	Est. Rel., 16K, 0.125W	16000	0.125		S
RCR05G222JS	R26, R35	Est. Rel., 2.2K, 0.125W	2200	0.125	0.075	S
RCR05G103JS	R27	Est. Rel., 10K, 0.125W	10000	0.125	0.075	S

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Ohms	Rated Power	Actual Power	Quality
RLR05C4R75FS	R20	Est. Rel., 4.75, 0.125W	4.75	0.125	0.075	S
RLR05C6811FS	R28, R29	Est. Rel., 6.81K, 0.125W	6810	0.125	0.075	S
RLR05C2000FS	R25	Est. Rel., 200, 0.125W	200	0.125	0.075	S
RNC55J1961FS	R7	Est. Rel., 1.96K. 0.1W	1960	0.1	0.002	S
RNC55D7681FS	R16	Est. Rel., 7.68K, 0.1W	7680	0.1	0.0077	S
RNC55D7321FS	R17	Est. Rel., 7.32K, 0.1W	7320	0.1	0.0073	S
RNC55D2002FS	R18	Est. Rel., 20K, 0.1W	20000	0.1	0.0025	S
RNC55D2002FS	R19	Est. Rel., 20K, 0.1W	20000	0.1	0.0025	S
RNC55D6191FS	R20	Est. Rel., 6.19K, 0.1W	6190	0.1	0.008	S
RNC55D8661FS	R21	Est. Rel., 8.66K, 0.1W	8660	0.1	0.0074	S
RNC55D2431FS	R22	Est. Rel, 2.43K, 0.1W	2430	0.1	0.0025	S

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	pF	Rated Temp.	Rated Voltage	Actual Voltage	Quality	
M39014/02-1350	C3-C8	Est. Rel., 0.1uF, 100V	100000	125	100	15	S	
M39014/02-1350	C9-C14	Est. Rel., 0.1uF, 100V	100000	125	100	5	S	
M39014/02-1347	C22	Est. Rel., 0.068uF, 100V	68000	125	100	7	S	50% Duty Cycle
M39014/01-1351	C23	Est.Rel., 470pF, 200V	470	125	200	5	S	
M123A01BXC102KC	C24	Est. Rel., 0.001uF, 100V	1000	125	100	15	S	

Capacitors, Fixed, Electrolytic, Tantalum, Solid

Part Number	Ref/Qty	Description	pF	Series Ohms	Rated Temp.	Rated Voltage	Actual Voltage	Quality
M39003/01-8194	C1, C2, C25	Est. Rel., 1uF, 50V	1.00E+06	0.1	125	50	15	S
M39003/01-8024	C15-C21	Est. Rel., 4.7uF, 10V	4.70E+06	0.1	125	10	5	S
M39003/01-3087	C26	Est. Rel., 3.9uF, 50V	3.90E+06	0.1	125	10	2.5	S

Connector, PCB	Ref/Qty	Description	Active Pins	Pin Gauge	Avg. Current	Temp. Rise	Quality	Mate / Unmate per 1000 hours
1337748-1	P1	Receptacle, 92-Contact	65	26	0.1	0.03	Mil	0.5

TABLE A2ES-EOS-9(Cont.)

SIG_PROC.XLS
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Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty	Description	*Layers*	*Quality*	*Wave Solder*	*Hand Solder*
1337804	1	Printed Wiring Board	*5*	*Mil*	*PTHs-> 372*	*0*

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TABLE A2ES-EOS-10

Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Failure Rate	ΠT	ΠE	ΠQ	ΠL	C1	C2
26044-1	U1,U4	Quadruple CMOS Switch	0.00269	0.257654	0.5	0.25	1	0.01	0.005593
M38510/10104SGX	U2,U3,U5,U6	Operational Amplifier	0.00325	0.22747	0.5	0.25	1	0.01	0.00196

Resistors, Fixed, Composition

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠR	ΠQ	ΠE
RCR05G102JS	R1,R6,R9,R14	1K, 0.125W	1.55E-05	0.000648	1	0.03	0.2
RCR05G101JS	R2-R5,R10-R13	100, 0.125W	3.12E-05	0.00065	1	0.03	0.2
RCR05G103JS	R17-R28	10K, 0.125W	4.66E-05	0.000648	1	0.03	0.2

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠR	ΠQ	ΠE
RNC55C5493FS	R7,R8,R15,R16	Est. Rel., 549K, 125mW	1.71E-05	0.000648	1.1	0.03	0.2

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠCV	ΠQ	ΠE
M123A02BXB104KC	8	Est. Rel., 0.1uF, 50V	0.00020	0.001399	1.454735	0.03	0.4
M39014/01-1339	C7, C8, C17, C18	Est. Rel., 0.1uF, 200V	4.57E-05	0.001399	0.680431	0.03	0.4

Capacitors, Fixed, Electrolytic, Tantalum, Solid

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠCV	ΠSR	ΠQ	ΠE
M39003/01-8194	C3, C4	Est. Rel., 1uF, 50V	5.28E-05	0.006666	1	0.33	0.03	0.4

Capacitors, Teflon

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠCV	ΠQ	ΠE
26028B154JSA	C1, C2, C11, C12	0.15uF, 50V	0.00023	0.004865	0.796399	0.03	0.5

Connector, PCB	Ref/Qty	Description	Failure Rate	λb	ΠK	ΠP	ΠE
1337748-1	P1	Receptacle, 92-Contact	0.00203	0.000285	1.5	9.500489	0.5

Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty		Failure Rate	λb	ΠC	ΠQ	ΠE	N1	N2
1338425	1	Printed Wiring Board	0.00408	1.7E-05	1.791697	1	0.5	268	0

Total Failure Rate: 0.01269

Part Number: 1338424 **Integrate and Dump Circuit Card Assembly** Schematic: 1338426

TABLE A2ES-EOS-10 (Cont.)

SIG_PROC.XLS
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Microcircuits, Gate/Logic Arrays and Microproc					Junct.		θjc		Mfr		
Part Number	Ref/Qty	Compl.	Tech.	Ea	Temp.	Watts	(°C/W)	Pins	Years	Package	Quality
26044-1	U1,U4	41	Linear	0.65	36.58	0.045	35	16	2	Hermetic	S
M38510/10104SGX	U2,U3,U5,U6	29	Linear	0.65	35.00	1.0E-6	40	8	2	Can	S

Resistors, Fixed, Composition			Rated	Actual	
Part Number	Ref/Qty	Ohms	Power	Power	Quality
RCR05G102JS	R1,R6,R9,R14	1000	0.125	0.000001	S
RCR05G101JS	R2-R5,R10-R13	100	0.125	0.0004	S
RCR05G103JS	R17-R28	10000	0.125		S

Resistors, Fixed, Film			Rated	Actual	
Part Number	Ref/Qty	Ohms	Power	Power	Quality
RNC55C5493FS	R7,R8,R15,R16	549000	0.125	0.00011	S

Capacitors, Fixed, Ceramic, General Purpose			Rated	Rated	Actual	
Part Number	Ref/Qty	pF	Temp.	Voltage	Voltage	Quality
M123A02BXB104KC	8	100000	85	50	15	S
M39014/01-1339	C7, C8, C17, C18	100	85	50	15	S

Capacitors, Fixed, Electrolytic, Tantalum, Solid			Rated	Rated	Actual	
Part Number	Ref/Qty	uF	Temp.	Voltage	Voltage	Quality
M39003/01-8194	C3, C4	1	85	50	15	S

Capacitors, Teflon			Rated	Rated	Actual	
Part Number	Ref/Qty	uF	Temp.	Voltage	Voltage	Quality
26028B154JSA	C1, C2, C11, C12	0.15	100	50	6.7	S

		Active	Pin	Avg.	Temp.		Mate / Unmate
Connector, PCB	Ref/Qty	Pins	Gauge	Current	Rise	Quality	per 1000 hours
1337748-1	P1	50	26	0.1	0.03	Mil	0.5

Interconnection Assemblies with Plated Throug						
Part Number	Ref/Qty	Layers	Quality		Wave Solder	Hand Solder
1338425	1	5	Mil	PTHs->	268	0

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TABLE A2ES-EOS-11

Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Failure Rate	ΠT	ΠE	ΠQ	ΠL	C1	C2
HS-80C85RH	U1	8-Bit Microprocessor	0.00745	0.159128	0.5	0.25	1	0.14	0.015045
HS-82C12RH/Q	U2, U8, U9	8-Bit I/O Port	0.00442	0.155765	0.5	0.25	1	0.01	0.008665
HS-54C138RH/Q	U4, U5, U7	3-to-8 Line Decoder	0.00442	0.155744	0.5	0.25	1	0.01	0.008665
CD40106	U13	Hex Schmitt Trigger	0.00108	0.188495	0.5	0.25	1	0.01	0.004841
CD4069UB	U14	Hex Inverter	0.00099	0.155851	0.5	0.25	1	0.01	0.004841
CD4081B	U15	Quadruple AND Gate	0.00099	0.155851	0.5	0.25	1	0.01	0.004841
CD4071B	U16	Quadruple OR Gate	0.00100	0.155931	0.5	0.25	1	0.01	0.004841

Microcircuits, Memories

Part Number	Ref/Qty	Description	Failure Rate	ΠT	ΠE	ΠQ	ΠL	C1	C2
MA7001	U6	512 x 9 FIFO	0.00175	0.243508	0.5	0.25	1	0.0078	0.010235
HS-6617RH	U10, U11	2K x 8 Fuse Link PROM	0.00224	0.240976	0.5	0.25	1	0.00065	0.008665
HS-81C56RH	U3	256 x 8 RAM	0.00230	0.215091	0.5	0.25	1	0.0078	0.015045

Microcircuits, Hybrids

Part Number	Ref/Qty	Description	Failure Rate	Ib	ΠE	ΠF	ΠQ	ΠL
BU61582	U12	Based on ILC Data (See Below)	0.05357	0.194796	0.5	1	0.25	1

Hybrid Microcircuits

Part Number	Ref/Qty	Description	Failure Rate	ΠT	ΠE	ΠQ	ΠL	C1	C2
JRAD	U3		0.12108	0.256781	0.5	1	1	0.16	0
RAM	U4	Rad-Hard Static RAM	0.05942	0.458462	0.5	1	1	0.062	0

Hybrid Diodes

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠT	ΠS	ΠC	ΠQ	ΠE
JANTX1N4148	CR1-CR4	Switching Diode	0.00054	0.0010	2.518209	0.054	1	1	1

Hybrid Capacitors

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠCV	ΠQ	ΠE
	C1, C11	2.2 pF, 50V, Fixed, Ceramic	0.00063	0.0007	0.447147	1	1
	C4, C14	22 pF, 50V, Fixed, Ceramic	0.00081	0.0007	0.576037	1	1
	C2, C3, C12, C	27 pF, 50V, Fixed, Ceramic	0.00165	0.0007	0.589161	1	1
	C5, C15	56 pF, 50V, Fixed, Ceramic	0.00089	0.0007	0.638388	1	1
	C7, C8, C17, C	82 pF, 50V, Fixed, Ceramic	0.00186	0.0007	0.665738	1	1
	C6, C16, C19-C26	10000 pF, 50V, Fixed, Ceramic	0.00790	0.0007	1.129234	1	1

TABLE A2ES-EOS-11 (Cont.)

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Diodes, Low Frequency

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠT	ΠS	ΠC	ΠQ	ΠE
JANS1N6642	CR1, CR2	Switching Diode	5.30E-05	0.001	1.400872	0.054	1	0.7	0.5

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠR	ΠQ	ΠE
RLR05C2002FS	R1	20K, 0.125W, 1%, Est. Rel.	3.92E-06	0.000653	1	0.03	0.2
RLR05C5002FS	R2	50K, 0.125W, 1%, Est. Rel.	3.92E-06	0.000653	1	0.03	0.2
RLR05C5002FS	R3-R8	50K, 0.125W, 1%, Est. Rel.	2.62E-05	0.000727	1	0.03	0.2
TBD	R9-R12	550K, 0.125W, 1%, Est. Rel.	1.74E-05	0.000727	1	0.03	0.2

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠCV	ΠQ	ΠE
M39014/01-1357	C1	1000pF	7.40E-06	0.000703	0.876564	0.03	0.4
M39014/01-1593	C4-C9	0.1uF, 50V, Est. Rel.	7.64E-05	0.000729	1.454735	0.03	0.4

Capacitors, Fixed, Electrolytic, Tantalum, Solid

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠCV	ΠΣP	ΠQ	ΠE
M39003/01-8024	C2	4.7uF, 10V, Est. Rel.	7.29E-05	0.015289	1.20407	0.33	0.03	0.4
M39003/01-8214	C3	4.7uF, 50V, Est. Rel.	9.17E-05	0.004773	1.20407	1.33	0.03	0.4

Inductive Devices, Transformers

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠQ	ΠE
TST-9002	1		0.04043	0.006739	12	0.5

Connector, PCB	Ref/Qty	Description	Failure Rate	λb	ΠK	ΠP	ΠE
1337748-1	P1	Receptacle, 92-Contact	0.00142	0.000285	1.5	6.658756	0.5

Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠC	ΠQ	ΠE	N1	N2
1356416-1	1	Printed Wiring Board	0.01107	1.7E-05	2.214752	1	0.5	588	0

Quartz Crystals	Ref/Qty	Description	Failure Rate	λb	ΠQ	ΠE
M55310/26	U17	Crystal Oscillator	0.00762	0.015247	1	0.5
M55310/26	U18	Crystal Oscillator	0.01230	0.024597	1	0.5

Total Failure Rate: 0.15342

Part Number: 1355998 **MIL-STD-1553B Interface Circuit Card Assembly** Schematic: 1355997

TABLE A2ES-EOS-11 (Cont.)

Microcircuits, Gate/Logic Arrays and MI

Part Number	Ref/Qty	Compl.	Tech.	Ea	Junct. Temp.	Watts	θjc (°C/W)	Pins	Mfr Years	Package	Quality
HS-80C85RH	U1	8	Digital	0.35	35.51	0.052	9.9	40	2	Hermetic	S
HS-82C12RH/Q	U2, U8, U9	46	Digital	0.35	35.02	0.001	15.1	24	2	Hermetic	S
HS-54C138RH/Q	U4, U5, U7	32	Digital	0.35	35.01	0.001	12	16	2	Hermetic	S
CD40106	U13	6	Digital	0.5	35.03	0.001	28	14	2	Hermetic	S
CD4069UB	U14	6	Digital	0.35	35.03	0.001	28	14	2	Hermetic	S
CD4081B	U15	4	Digital	0.35	35.03	0.001	28	14	2	Hermetic	S
CD4071B	U16	4	Digital	0.35	35.04	0.001	40	14	2	Hermetic	S

Microcircuits, Memories

Part Number	Ref/Qty	K-Bits	Tech./Type	Ea	Junct. Temp.	Watts	θjc (°C/W)	Pins	Mfr Years	Package	Quality
MA7001	U6	5	MOS/SRAM	0.6	36.80	0.15	12	28	2	Hermetic	S
HS-6617RH	U10, U11	16	MOS/PROM	0.6	36.66	0.138	12	24	2	Hermetic	S
HS-81C56RH	U3	2	MOS/SRAM	0.6	35.10	0.01	9.9	40	2	Hermetic	S

Microcircuits, Hybrids

Part Number	Ref/Qty	Function	Mfr Years	Quality	
BU61582	U12	Digital	2	S	Pre-Elect. Burn-In, PIND, X-Ray performed on S Level Hybrid

Hybrid Microcircuits

Part Number	Ref/Qty	Compl.	Tech.	Ea	Junct. Temp.	Watts	θjc (°C/W)	Mfr Years	Quality
JRAD	U3	13000	Digital	0.35	47.15	0.49	4.39	2	B
RAM	U4	262	MOS/SRAM	0.6	45.77	0.3	2.58	2	B

Hybrid Diodes

Part Number	Ref/Qty	Contact	Type/App	Rated Voltage	Applied Voltage	Junct. Temp.	Watts	θjc (°C/W)	Quality
JANTX1N4148	CR1-CR4	Metal	Switch	100	20	54.13	0.198	96.6	JANTX

Hybrid Capacitors

Part Number	Ref/Qty	pF	Rated Temp.	Rated Voltage	Actual Voltage	Quality
	C1, C11	2.2	125	50	5.5	M
	C4, C14	22	125	50	5.5	M
	C2, C3, C12, C	27	125	50	5.5	M
	C5, C15	56	125	50	5.5	M
	C7, C8, C17, C	82	125	50	5.5	M
	C6, C16, C19-C26	10000	125	50	5.5	M

TABLE A2ES-EOS-11 (Cont.)

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Diodes, Low Frequency				Rated	Applied	Junct.		θjc			
Part Number	Ref/Qty	Contact	Type/App	Voltage	Voltage	Temp.	Watts	(°C/W)	Case	Quality	
JANS1N6642	CR1, CR2	Metal	Switch	75	20	35.01	0.001	10	DO-35	JANTXV	/116

Resistors, Fixed, Film			Rated	Actual	
Part Number	Ref/Qty	Ohms	Power	Power	Quality
RLR05C2002FS	R1	20000	0.125	0.001	S
RLR05C5002FS	R2	50000	0.125	0.001	S
RLR05C5002FS	R3-R8	50000	0.125	0.013	S
TBD	R9-R12	55	0.125	0.013	S

Capacitors, Fixed, Ceramic, General Pur			Rated	Rated	Actual	
Part Number	Ref/Qty	pF	Temp.	Voltage	Voltage	Quality
M39014/01-1357	C1	1000	85	100	5.25	S
M39014/01-1593	C4-C9	100000	85	50	5.25	S

Capacitors, Fixed, Electrolytic, Tantalu			Rated	Rated	Actual	
Part Number	Ref/Qty	uF	Temp.	Voltage	Voltage	Quality
M39003/01-8024	C2	4.7	85	10	5.25	S
M39003/01-8214	C3	4.7	85	50	5.25	S

Inductive Devices, Transformers				Rated		
Part Number	Ref/Qty	THS	Type	Temp.	Quality	
TST-9002	1	61.91	RF	85	Mil	

		Active	Pin	Avg.	Temp.		Mate / Unmate
Connector, PCB	Ref/Qty	Pins	Gauge	Current	Rise	Quality	per 1000 hours
1337748-1	P1	36	26	0.1	0.03	Mil	0.5

Interconnection Assemblies with Plated						
Part Number	Ref/Qty	Layers	Quality		Wave Solder	Hand Solder
1356416-1	1	7	Mil	PTHs->	588	0

Quartz Crystals	Ref/Qty	Quality	Freq (MHz)
M55310/26	U17	Mil	2
M55310/26	U18	Mil	16

TABLE A2ES-EOS-12

SIG_PROC.XLS
03/13/1996

Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Failure Rate	ΠT	ΠE	ΠQ	ΠL	C1	C2
25012/03-1	U1	3-to-8 Line Decoder	0.00118	0.155664811	0.5	0.25	1	0.0025	0.008665351
25012/02-1	U2-U6	8-Bit I/O Port	0.00590	0.155682025	0.5	0.25	1	0.0025	0.008665351
25012/07-1	U7	8-Bit Down Counter	0.00080	0.155666278	0.5	0.25	1	0.0025	0.005592521
25012/08-1	U8, U14-U16	Sync. 4-Bit Counter	0.00319	0.155668144	0.5	0.25	1	0.0025	0.005592521
M38510R17101SCX	U9	Counter/Divider	0.00080	0.155666278	0.5	0.25	1	0.0025	0.005592521
M38510R17401SCX	U11, U21	Hex Inverter	0.00140	0.15567281	0.5	0.25	1	0.0025	0.00484146
M38510R05151SCX	U10,U13,U19,U20	Dual 'D' Flip-Flop	0.00319	0.155665345	0.5	0.25	1	0.0025	0.005592521
M38510H17001SCX	U22	Quadruple AND Gate	0.00070	0.155668144	0.5	0.25	1	0.0025	0.00484146
M38510H05554SEX	U23	Hex Buffer	0.00080	0.155679342	0.5	0.25	1	0.0025	0.005592521

Microcircuits, Memories

Part Number	Ref/Qty	Description	Failure Rate	ΠT	ΠE	ΠQ	ΠL	C1	C2
25012/05-1	U18	2K x 8 Fuse Link PROM	0.00111	0.155664811	0.5	0.25	1	0.00065	0.008665351

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠCV	ΠQ	ΠE
M123A02BXB104KC	C2-C14	Est. Rel., 0.1uF, 50V	0.00016	0.000725252	1.454734896	0.03	0.4
M39014/01-1575	C15, C16	Est. Rel., 0.1uF, 100V	1.14E-05	0.000700167	0.680430632	0.03	0.4

Capacitors, Fixed, Electrolytic, Tantalum

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠCV	ΠSR	ΠQ	ΠE
M39003/01-8194	C1	Est. Rel., 1uF, 50V	2.64E-05	0.006666495	1	0.33	0.03	0.4

Connector, PCB	Qty/Ref	Description	Failure Rate	λb	ΠK	ΠP	ΠE
1337748-1	P1	Receptacle, 92-Contact	0.00243	0.000284711	1.5	11.38266573	0.5

Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠC	ΠQ	ΠE	N1	N2
1337293-1	1	Printed Wiring Board	0.00715	1.7E-05	1.556722316	1	0.5	540	0

Total Failure Rate: 0.02884

Part Number: 1331135

Timing and Control Circuit Card Assembly

Schematic: 1331136

TABLE A2ES-EOS-12 (Cont.)

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Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Gates	Tech.	Ea	Junct. Temp.	Watts	θjc (°C/W)	Pins	Mfr Years	Package	Quality
25012/03-1	U1	3-to-8 Line Decoder	32	Digital	0.35	35.00	5.0E-6	12	16	2	Hermetic	S
25012/02-1	U2-U6	8-Bit I/O Port	46	Digital	0.35	35.00	175.0E-6	15.1	24	2	Hermetic	S
25012/07-1	U7	8-Bit Down Counter	31	Digital	0.35	35.00	10.0E-6	28	16	2	Hermetic	S
25012/08-1	U8, U14-U16	Sync. 4-Bit Counter	60	Digital	0.35	35.00	20.0E-6	28	16	2	Hermetic	S
M38510R17101SCX	U9	Counter/Divider	36	Digital	0.35	35.00	10.0E-6	28	16	2	Hermetic	S
M38510R17401SCX	U11, U21	Hex Inverter	6	Digital	0.35	35.00	45.0E-6	28	14	2	Hermetic	S
M38510R05151SCX	U10,U13,U19,U20	Dual 'D' Flip-Flop	15	Digital	0.35	35.00	5.0E-6	28	16	2	Hermetic	S
M38510H17001SCX	U22	Quadruple AND Gate	4	Digital	0.35	35.00	20.0E-6	28	14	2	Hermetic	S
M38510H05554SEX	U23	Hex Buffer	6	Digital	0.35	35.00	80.0E-6	28	16	2	Hermetic	S

Microcircuits, Memories

Part Number	Ref/Qty	Description	K-Bits	Tech./Type	Ea	Junct. Temp.	Watts	θjc (°C/W)	Pins	Mfr Years	Package	Quality
25012/05-1	U18	2K x 8 Fuse Link PROM	16	MOS/PROM	0.35	35.00	5.0E-6	12	24	2	Hermetic	S

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	pF	Rated Temp.	Rated Voltage	Actual Voltage	Quality
M123A02BXB104KC	C2-C14	Est. Rel., 0.1uF, 50V	100000	85	50	5	S
M39014/01-1575	C15, C16	Est. Rel., 0.1uF, 100V	100	85	100	3.16	S

Capacitors, Fixed, Electrolytic, Tantalum

Part Number	Ref/Qty	Description	uF	Rated Temp.	Rated Voltage	Actual Voltage	Quality
M39003/01-8194	C1	Est. Rel., 1uF, 50V	1	85	50	15	S

Connector, PCB	Qty/Ref	Description	Active Pins	Pin Gauge	Avg. Current	Temp. Rise	Quality	Mate / Unmate per 1000 hours
1337748-1	P1	Receptacle, 92-Contact	58	26	0.1	0.03	Mil	0.5

Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty	Description	Layers	Quality		Wave Soder	Hand Solder
1337293-1	1	Printed Wiring Board	4	Mil	PTHs->	540	0

Total Failure Rate:

TABLE A2ES-EOS-13

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Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Failure Rate	ΠT	ΠE	ΠQ	ΠL	C1	C2
M38510/17401SCX	U1	Hex Inverter	0.00070	0.155678	0.5	0.25	1	0.0025	0.004841
M38510H05554SEX	U3	Hex Buffer	0.00070	0.155666	0.5	0.25	1	0.0025	0.004841
25012/01-1	U4, U12-U14	8-Bit I/O Port	0.00472	0.15567	0.5	0.25	1	0.0025	0.008665
25012/09-1	U5	8-Bit Microprocessor	0.00733	0.155678	0.5	0.25	1	0.14	0.015045
M38510H05051SCX	U6	Quadruple NAND Gate	0.00070	0.155666	0.5	0.25	1	0.0025	0.004841
25012/03-1	U7	3-to-8 Line Decoder	0.00080	0.155672	0.5	0.25	1	0.0025	0.005593
M38510R17001SCX	U8	Quadruple AND Gate	0.00070	0.155666	0.5	0.25	1	0.0025	0.004841
M38510/17101SCX	U9	Quadruple OR Gate	0.00070	0.155691	0.5	0.25	1	0.0025	0.004841
25012/01-1	U11	8-Bit Bus Transceiver	0.00099	0.155673	0.5	0.25	1	0.0025	0.007117

Microcircuits, Memories

Part Number	Ref/Qty	Description	Failure Rate	ΠT	ΠE	ΠQ	ΠL	C1	C2
HS-65647RH	U10	8Kx8 RAM Module	0.00274	0.21366	0.5	0.25	1	0.016	0.015045

Diodes, Low Frequency

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠT	ΠS	ΠC	ΠQ	ΠE
JANS1N4148-1	CR1	Diode	0.00010	0.0038	1.400416	0.054	1	0.7	0.5

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠR	ΠQ	ΠE
RLR05C2002FS	R1	20K, 0.125W, Est. Rel.	3.93E-06	0.000654	1	0.03	0.2
RLR05C1003FS	R2-R6	100K, 0.125W, Est. Rel.	2.24E-05	0.000679	1.1	0.03	0.2

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠCV	ΠQ	ΠE
M39014/01-1593	C2-C7	0.1uF, 50V, Est. Rel.	7.60E-05	0.000725	1.454735	0.03	0.4

Capacitors, Fixed, Electrolytic, Tantalum, Solid

Part Number	Ref/Qty	Description	Failure Rate	λb	PCV	ΠSR	ΠQ	ΠE
M39003/01-8214	C1	4.7uF, 50V, Est. Rel.	2.27E-05	0.004762	1.20407	0.33	0.03	0.4
M39003/01-8024	C8	4.7uF, 10V, Est. Rel.	6.60E-05	0.013846	1.20407	0.33	0.03	0.4

Part Number: 1356413

CPU Circuit Card Assembly

Schematic: 1356414

TABLE A2ES-EOS-13 (Cont.)

Connector, PCB	Ref/Qty	Description	Failure Rate	λb	ΠK	ΠP	ΠE
1337748-1	P1	Receptacle, 92-Contact	0.00171	0.000285	1.5	8.011861	0.5

Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠC	ΠQ	ΠE	N1	N2
1337282-1	1	PWB, CPU	0.00738	1.7E-05	2.009781	1	0.5	432	0

Quartz Crystals	Ref/Qty	Description	Failure Rate	λb	ΠQ	ΠE
M55310/26	U2	Clock Oscillator	0.00684	0.01368	1	0.5

Connections	Ref/Qty	Description	Failure Rate	λb	ΠQ	ΠE
Hand Solder, with Wrapping	2	E1 - E2 Connection	0.00014	0.00014	1	0.5

Total Failure Rate: 0.02334

Part Number: 1356413 **CPU Circuit Card Assembly** Schematic: 1356414

TABLE A2ES-EOS-13 (Cont.)

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Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Compl.	Tech.	Ea	Junct. Temp.	Actual Watts	θjc (°C/W)	Pins	Mfr Years	Package	Quality
M38510/17401SCX	U1	Hex Inverter	5	Digital	0.35	35.00	0.00005	40	14	2	Hermetic	S
M38510H05554SEX	U3	Hex Buffer	5	Digital	0.35	35.00	5.0E-6	40	14	2	Hermetic	S
25012/01-1	U4, U12-U14	8-Bit I/O Port	46	Digital	0.35	35.00	55.0E-6	15.1	24	2	Hermetic	S
25012/09-1	U5	8-Bit Microprocessor	8	Digital	0.35	35.00	0.0002	9.9	40	2	Hermetic	S
M38510H05051SCX	U6	Quadruple NAND Gate	1	Digital	0.35	35.00	5.0E-6	40	14	2	Hermetic	S
25012/03-1	U7	3-to-8 Line Decoder	32	Digital	0.35	35.00	0.0001	12	16	2	Hermetic	S
M38510R17001SCX	U8	Quadruple AND Gate	2	Digital	0.35	35.00	5.0E-6	40	14	2	Hermetic	S
M38510/17101SCX	U9	Quadruple OR Gate	2	Digital	0.35	35.00	0.0001	40	14	2	Hermetic	S
25012/01-1	U11	8-Bit Bus Transceiver	54	Digital	0.35	35.00	105.0E-6	12	20	2	Hermetic	S

Microcircuits, Memories

Part Number	Ref/Qty	Description	K-Bits	Tech./Type	Ea	Junct. Temp.	Actual Watts	θjc (°C/W)	Pins	Mfr Years	Package	Quality
HS-65647RH	U10	8Kx8 RAM Module	64	MOS/SRAM	0.6	35.01	0.0002	40	40	2	Hermetic	S

Diodes, Low Frequency

Part Number	Ref/Qty	Description	Rated Voltage	Actual Voltage	θjc (°C/W)	Junct. Temp.	Rated Watts	Actual Watts	Case	Quality
JANS1N4148-1	CR1	Diode	75	5	10	35.00	0.383	1.0E-6	DO-3	JANTXV

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Ohms	Rated Watts	Actual Watts	Quality
RLR05C2002FS	R1	20K, 0.125W, Est. Rel.	20000	0.125	0.0012	S
RLR05C1003FS	R2-R6	100K, 0.125W, Est. Rel.	100000	0.125	0.0053	S

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	pF	Rated Temp.	Rated Voltage	Actual Voltage	Quality
M39014/01-1593	C2-C7	0.1uF, 50V, Est. Rel.	100000	85	50	5	S

Capacitors, Fixed, Electrolytic, Tantalum, Solid

Part Number	Ref/Qty	Description	uF	Rated Temp.	Rated Voltage	Actual Voltage	Quality
M39003/01-8214	C1	4.7uF, 50V, Est. Rel.	4.7	85	50	5	S
M39003/01-8024	C8	4.7uF, 10V, Est. Rel.	4.7	85	10	5	S

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TABLE A2ES-EOS-13 (Cont.)

Connector, PCB	Ref/Qty	Description	Active Pins	Pin Gauge	Average Current	Temp. Rise	Quality	Mate / Unmate per 1000 hours
1337748-1	P1	Receptacle, 92-Contact	43	26	0.1	0.03	Mil	0.5

Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty	Description	Layers	Quality		Wave Solder	Hand Solder
1337282-1	1	PWB, CPU	6	Mil	PTHs->	432	0

Quartz Crystals	Ref/Qty	Description	Quality	Freq (MHz)
M55310/26	U2	Clock Oscillator	Mil	1.248

TABLE A2ES-EOS-14

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Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Failure Rate	ΠT	ΠE	ΠQ	ΠL	C1	C2
25012/03-1	U9	3-to-8 Line Decoder	0.00080	0.15567241	0.5	0.25	1	0.0025	0.005592521

Microcircuits, Memories

Part Number	Ref/Qty	Description	Failure Rate	ΠT	ΠE	ΠQ	ΠL	C1	C2
25012/05-3	U1-U8	2K x 8 Fuse Link PROM	0.00887	0.155678409	0.5	0.25	1	0.00065	0.008665351

Diodes, Low Frequency

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠT	ΠS	ΠC	ΠQ	ΠE
JANS1N4148-1	CR1	Diode	0.00010	0.0038	1.400415897	0.054	1	0.7	0.5

Resistors, Fixed, Film (Established Reliability)

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠR	ΠQ	ΠE
RLR05C2002FS	R1	20K, 0.125W, Insulated	3.93E-06	0.000654479	1	0.03	0.2
RLR05C1003FS	R2-R6	100K, 0.125W, Insulated	2.24E-05	0.000678744	1.1	0.03	0.2

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠCV	ΠQ	ΠE
M123A02BXC104KC	C2-C6	0.1uF, 100V, Est. Rel.	6.33E-05	0.000725252	1.454734896	0.03	0.4

Capacitors, Fixed, Electrolytic, Tantalum, Solid

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠCV	ΠSR	ΠQ	ΠE
M39003/01-8214	C1	4.7uF, 50V, Est. Rel.	2.27E-05	0.004761782	1.20407002	0.33	0.03	0.4

Connector, PCB	Ref/Qty	Description	Failure Rate	λb	ΠK	ΠP	ΠE
1337748-1	P1	Receptacle, 92-Contact	0.00123	0.000284711	1.5	5.76852232	0.5

Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠC	ΠQ	ΠE	N1	N2
1337283-1	1	Printed Wiring Board	0.00431	1.7E-05	1.556722316	1	0.5	326	0

Total Failure Rate: 0.01542

Part Number: 1331126

Memory Circuit Card Assembly

Schematic: 1331127

TABLE A2ES-EOS-14 (Cont.)

Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Compl.	Tech.	Ea	Junct. Temp.	Watts	θjc (°C/W)	Pins	Mfr Years	Package	Quality
25012/03-1	U9	3-to-8 Line Decoder	32	Digital	0.35	35.00	0.0001	12	16	2	Hermetic	S

Microcircuits, Memories

Part Number	Ref/Qty	Description	K-Bits	Tech./Type	Ea	Junct. Temp.	Watts	θjc (°C/W)	Pins	Mfr Years	Package	Quality
25012/05-3	U1-U8	2K x 8 Fuse Link PROM	16	MOS/PROM	0.35	35.00	0.000175	12	24	2	Hermetic	S

Diodes, Low Frequency

Part Number	Ref/Qty	Description	Rated Voltage	Actual Voltage	θjc (°C/W)	Junct. Temp.	Rated Power	Actual Power	Case	Quality
JANS1N4148-1	CR1	Diode	75	5	10	35.00	0.383	1.0E-6	DO-3	JANTXV

Resistors, Fixed, Film (Established Reliability)

Part Number	Ref/Qty	Description	Ohms	Quality	Rated Power	Actual Power
RLR05C2002FS	R1	20K, 0.125W, Insulated	20000	S	0.125	0.0012
RLR05C1003FS	R2-R6	100K, 0.125W, Insulated	100000	S	0.125	0.0053

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	pF	Quality	Rated Temp.	Rated Voltage	Actual Voltage
M123A02BXC104KC	C2-C6	0.1uF, 100V, Est. Rel.	100000	S	85	50	5

Capacitors, Fixed, Electrolytic, Tantalum, Solid

Part Number	Ref/Qty	Description	uF	Quality	Rated Temp.	Rated Voltage	Actual Voltage
M39003/01-8214	C1	4.7uF, 50V, Est. Rel.	4.7	S	85	50	5

Connector, PCB	Ref/Qty	Description	Active Pins	Pin Gauge	Avg. Current	Temp. Rise	Quality	Mate / Unmate per 1000 hours
1337748-1	P1	Receptacle, 92-Contact	31	26	0.1	0.03	Mil	0.5

Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty	Description	Layers	Quality		Wave Solder	Hand Solder
1337283-1	1	Printed Wiring Board	4	Mil	PTHs->	326	0

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TABLE A2ES-EOS-15

Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Failure Rate	ΠT	ΠE	ΠQ	ΠL	C1	C2
25012/02-1	U1, U3, U5, U7	8-Bit I/O Port	0.00472	0.155682	0.5	0.25	1	0.0025	0.008665
25012/02-1	U2, U4, U6, U8	8-Bit I/O Port	0.00472	0.155674	0.5	0.25	1	0.0025	0.008665
25012/03-1	U9	3-to-8 Line Decoder	0.00080	0.155665	0.5	0.25	1	0.0025	0.005593
M38510/17401SCX	U10	Hex Inverter	0.00070	0.155668	0.5	0.25	1	0.0025	0.004841

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠCV	ΠQ	ΠE
M39014/01-1593	C1	Est. Rel., 0.1uF, 50V	1.27E-05	0.000725	1.454735	0.03	0.4

Capacitors, Fixed, Electrolytic, Tantalum

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠCV	ΠSR	ΠQ	ΠE
M39003/01-8209	C2-C5	Est. Rel., 3.3uF, 50V	8.70E-05	0.004762	1.154042	0.33	0.03	0.4

Connector, PCB	Ref/Qty	Description	Failure Rate	λb	ΠK	ΠP	ΠE
AS8137-1A20Y-0	P1	Connector	0.00099	0.000285	1.5	4.618523	0.5

Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠC	ΠQ	ΠE	N1	N2
1337285-1	1	Printed Wiring Board	0.00552	1.7E-05	1.556722	1	0.5	417	0

Total Failure Rate: 0.00731

TABLE A2ES-EOS-15 (Cont.)

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Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Compl.	Tech.	Ea	Junct. Temp.	Watts	θjc (°C/W)	Pins	Mfr Years	Package	Quality
25012/02-1	U1, U3, U5, U7	8-Bit I/O Port	46	Digital	0.35	35.00	175.0E-6	15.1	24	2	Hermetic	S
25012/02-1	U2, U4, U6, U8	8-Bit I/O Port	46	Digital	0.35	35.00	100.0E-6	15.1	24	2	Hermetic	S
25012/03-1	U9	3-to-8 Line Decoder	32	Digital	0.35	35.00	10.0E-6	12	16	2	Hermetic	S
M38510/17401SCX	U10	Hex Inverter	6	Digital	0.35	35.00	20.0E-6	28	14	2	Hermetic	S

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	pF	Rated Temp.	Rated Voltage	Actual Voltage	Quality
M39014/01-1593	C1	Est. Rel., 0.1uF, 50V	100000	85	50	5	S

Capacitors, Fixed, Electrolytic, Tantalum

Part Number	Ref/Qty	Description	uF	Rated Temp.	Rated Voltage	Actual Voltage	Quality
M39003/01-8209	C2-C5	Est. Rel., 3.3uF, 50V	3.3	85	50	5	S

Connector, PCB	Ref/Qty	Description	Active Pins	Pin Gauge	Avg. Current	Temp. Rise	Quality	Mate / Unmate per 1000 hours
AS8137-1A20Y-0	P1	Connector	24	26	0.1	0.03	Mil	0.5

Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty	Description	Layers	Quality	Wave Solder	Hand Solder
1337285-1	1	Printed Wiring Board	4	Mil	PTHs-> 417	0

Total Failure Rate:

TABLE A2ES-EOS-16

SIG_PROC.XLS
03/13/1996

Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Failure Rate	ΠT	ΠE	ΠQ	ΠL	C1	C2
AS8083-27	U2	3-to-8 Line Decoder	0.00109	0.155664	0.5	0.25	1	0.01	0.005593
AS8322/11404SGX	U8, U9	JFET Input Op. Amp.	0.00151	0.227469	0.5	0.25	1	0.01	0.001499
AS8322/11005SCX	U10	Quadruple Op. Amp.	0.00117	0.227469	0.5	0.25	1	0.01	0.004841
AS8083-25	U11	CMOS Hex Inverter	0.00099	0.155664	0.5	0.25	1	0.01	0.004841
AS8322/30302SCX	U12	Triple 3-Input NOR	0.00117	0.227469	0.5	0.25	1	0.01	0.004841
AS8322/19002SCX	U13, U14	CMOS Analog Mux.	0.00711	0.227469	0.5	0.25	1	0.04	0.010235

Microcircuits, Memories

Part Number	Ref/Qty	Description	Failure Rate	ΠT	ΠE	ΠQ	ΠL	C1	C2
AS8083-36	U1	HS81C55RH/Q RAM	0.00218	0.155664	0.5	0.25	1	0.0078	0.015045

Diodes

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠT	ΠS	ΠC	ΠQ	ΠE
AS8301-1N6642-S	CR1-CR5	Switching Diode	0.00039	0.001	1.419685	0.156923	1	0.7	0.5
AS8301-1N6642-S	CR6, CR7	Switching Diode	5.29E-05	0.001	1.40047	0.054	1	0.7	0.5
AS8301-1N759A1S	VR1	Zener Diode, Vz=12.0	0.00158	0.002	2.258205	1	1	0.7	0.5

Transistors, Low Frequency, Bipolar

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠT	ΠA	ΠR	ΠS	ΠQ	ΠE
AS8302-2N2907AS	Q1, Q2	PNP General Purpose	1.65E-05	0.00074	1.265894	0.7	0.656002	0.274512	0.7	0.5
AS8302-2N2907AS	Q3 -Q6	PNP General Purpose	3.30E-05	0.00074	1.262447	0.7	0.656002	0.274512	0.7	0.5
AS8302-2N2222AS	Q7-Q9	NPN General Purpose	2.69E-05	0.00074	1.265894	0.7	0.712463	0.274512	0.7	0.5

Optoelectronics

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠT	ΠQ	ΠE
JANS4N49	U3, U4	Optical Isolator	6.92E-06	0.013	0.000292	0.7	13
JANS4N49	U5-U7	Optical Isolator	1.04E-05	0.013	0.000292	0.7	13

Resistors, Fixed, Composition

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠR	ΠQ	ΠE
RCR05G101JS	R1, R7	100, 0.125W, Est. Rel.	7.80E-06	0.00065	1	0.03	0.2
RCR05G101JS	R2, R8	100, 0.125W, Est. Rel.	7.78E-06	0.000648	1	0.03	0.2
RCR05G101JS	R3-R6	100, 0.125W, Est. Rel.	1.58E-05	0.000657	1	0.03	0.2
RCR05G101JS		100, 0.125W, Est. Rel.	3.89E-06	0.000648	1	0.03	0.2

Part Number: 1356000 **Mutliplexer / Relay Control Circuit Card Assembly** Schematic: 1355999

TABLE A2ES-EOS-16 (Cont.)

SIG_PROC.XLS
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Resistors, Fixed, Composition

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠR	ΠQ	ΠE
RCR05G202JS	R11, R12	2K, 0.125W, Est. Rel.	9.12E-06	0.00076	1	0.03	0.2
RCR05G102JS	R13, R14	1K, 0.125W, Est. Rel.	8.96E-06	0.000746	1	0.03	0.2
RCR05G512JS	R15-R17	5.1K, 0.125W, Est. Rel.	1.50E-05	0.000832	1	0.03	0.2
RCR05G512JS	R18, R19	5.1K, 0.125W, Est. Rel.	7.78E-06	0.000648	1	0.03	0.2
RCR05G103JS	R20, R21	10K, 0.125W, Est. Rel.	1.24E-05	0.001036	1	0.03	0.2
RCR05G103JS	R22-R24	10K, 0.125W, Est. Rel.	1.17E-05	0.000648	1	0.03	0.2
RCR05G106JS	R29, R30	10M, 0.125W, Est. Rel.	1.94E-05	0.000648	2.5	0.03	0.2
RCR05G155JS	R43, R44	1.5M, 0.125W, Est. Rel.	1.24E-05	0.000648	1.6	0.03	0.2
RCR05G512JS	R47, R48	5.1K, 0.125W, Est. Rel.	7.78E-06	0.000648	1	0.03	0.2
RCR20G242JS	R61	2.4K, 0.5W, Est. Rel.	4.92E-06	0.000821	1	0.03	0.2

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠR	ΠQ	ΠE
RNC50J1002FS	R25-R28	10K, 0.05W	1.55E-05	0.000648	1	0.03	0.2
RNC50J1003FS	R31, R32	100K, 0.05W	8.62E-06	0.000653	1.1	0.03	0.2
RNC50J2002FS	R33, R34	20K, 0.06W	7.78E-06	0.000648	1	0.03	0.2
RNC55J2803FS	R35, R36	280K, 0.1W	8.56E-06	0.000648	1.1	0.03	0.2
RNC55J2263FS	R37, R38	226K, 0.1W	8.55E-06	0.000648	1.1	0.03	0.2
RNC55J1004FS	R39, R40	1M, 0.1W	1.24E-05	0.000648	1.6	0.03	0.2
RNC55J2003FS	R41, R42	200K, 0.05W	8.58E-06	0.00065	1.1	0.03	0.2
RNC55J1003FS	R45, R46	100K, 0.05W	8.55E-06	0.000648	1.1	0.03	0.2
RLR05C1822FS	R49, R50	18.2K, 0.125W	9.10E-06	0.000759	1	0.03	0.2
RLR05C3011FS	R51, R52	3.01K, 0.125W	8.70E-06	0.000725	1	0.03	0.2
RLR05C8061FS	R53, R54	8.06K, 0.125W	8.34E-06	0.000695	1	0.03	0.2
RLR05C1212FS	R55, R58	12.1K, 0.125W	8.63E-06	0.000719	1	0.03	0.2
RLR05C1212FS	R56, R59	12.1K, 0.125W	8.64E-06	0.00072	1	0.03	0.2
RLR05C1212FS	R57, R60	12.1K, 0.125W	8.64E-06	0.00072	1	0.03	0.2
RLR05C2202FS	R62, R63	22K, 0.125W	9.64E-06	0.000803	1	0.03	0.2

Resistors, Network, Fixed, Film

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠT	ΠNR	ΠQ	ΠE
M83401K2001JA	RN1A-RN1C	2K, 0.125W	0.00011	0.00006	1.251902	3	1	0.5
M83401K1002JA	RN2A-RN2C	10K, 0.125W	0.00012	0.00006	1.2944	3	1	0.5
M83401K2001JA	RN3A-RN3C	2K, 0.125W	0.00012	0.00006	1.386908	3	1	0.5

TABLE A2ES-EOS-16 (Cont.)

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠCV	ΠQ	ΠE
M123A02BXC104KC	C3, C4, C11, C12	0.1uF, 100V, Est. Rel.	4.51E-05	0.000645	1.454735	0.03	0.4
M123A02BXC104KC	C5, C7, C9, C10	0.1uF, 100V, Est. Rel.	5.13E-05	0.000735	1.454735	0.03	0.4
M123A02BXC104KC	C6, C8	0.1uF, 100V, Est. Rel.	2.25E-05	0.000645	1.454735	0.03	0.4

Capacitors, Fixed, Electrolytic, Tantalum, Solid

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠCV	ΠSR	ΠQ	ΠE
M39003/01-8066	C1	1.2uF, 20V, Est. Rel.	2.36E-05	0.005833	1.02212	0.33	0.03	0.4
M39003/01-8282	C2	3.3uF, 75V, Est. Rel.	3.88E-05	0.0085	1.154042	0.33	0.03	0.4
M39003/01-8069	C13	1uF, 50V, Est. Rel.	2.26E-05	0.005701	1	0.33	0.03	0.4
M39003/01-8069	C14	1uF, 50V, Est. Rel.	2.26E-05	0.005701	1	0.33	0.03	0.4
M39003/01-8078	C15, C16	10uF, 20V, Est. Rel.	5.51E-05	0.005275	1.318257	0.33	0.03	0.4

Connector, PCB	Ref/Qty	Description	Failure Rate	λb	ΠK	PP	ΠQ	ΠE
1337748-1	P1	Receptacle, 92-Contact	0.00227	0.000285	1.5	10.65323	0.5	

Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠC	ΠQ	ΠE	N1	N2
1356417-1	1	Printed Wiring Board	0.00909	1.7E-05	2.009781	1	0.5	532	0

Total Failure Rate: 0.02586

TABLE A2ES-EOS-16 (Cont.)

SIG_PROC.XLS
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Microcircuits, Gate/Logic Arrays and Microproc

Part Number	Ref/Qty	Compl.	Tech.	Ea	Junct. Temp.	Actual Watts	θjc (°C/W)	Pins	Mfr Years	Package	Quality
AS8083-27	U2	32	Digital	0.35	35.00		12	16	2	Hermetic	S
AS8322/11404SGX	U8, U9	29	Linear	0.65	35.00		23	7	2	Can	S
AS8322/11005SCX	U10	13	Linear	0.65	35.00			14	2	Hermetic	S
AS8083-25	U11	3	Digital	0.35	35.00		20	14	2	Hermetic	S
AS8322/30302SCX	U12	32	Linear	0.65	35.00		20	14	2	Hermetic	S
AS8322/19002SCX	U13, U14	485	Linear	0.65	35.00		18	28	2	Hermetic	S

Microcircuits, Memories

Part Number	Ref/Qty	K-Bits	Tech./Type	Ea	Junct. Temp.	Actual Watts	θjc (°C/W)	Pins	Mfr Years	Package	Quality
AS8083-36	U1	2	MOS/RAM	0.35	35.00		9.9	40	2	Hermetic	S

Diodes

Part Number	Ref/Qty	Contact	Type/App	Rated Voltage	Applied Voltage	Junct. Temp.	Actual Watts	θjl (°C/W)	Case	Quality	Mil-S-195
AS8301-1N6642-S	CR1-CR5	Metal	Switch	75	35	35.42	3.5E-3	120	DO-35	JANTXV	/578
AS8301-1N6642-S	CR6, CR7	Metal	Switch	75	10	35.00	10.0E-6	120	DO-35	JANTXV	/578
AS8301-1N759A1S	VR1	Metal	V. Ref.	-	-	68.00	0.165	200	DO-35	JANTXV	/127

Transistors, Low Frequency, Bipolar

Part Number	Ref/Qty	Case	θjc (°C/W)	Junct. Temp.	Rated Power	Actual Power	Rated Vceo	VCE Applied	Appl. (Lin/Sw)	Quality
AS8302-2N2907AS	Q1, Q2	TO-18	70	35.25	0.32	0.0035	60	35	Sw	JANTXV
AS8302-2N2907AS	Q3 -Q6	TO-18	70	35.12	0.32	0.00175	60	35	Sw	JANTXV
AS8302-2N2222AS	Q7-Q9	TO-18	70	35.25	0.4	0.0035	60	35	Sw	JANTXV

Optoelectronics

Part Number	Ref/Qty	θjc (°C/W)	Junct. Temp.	Rated Power	Actual Power	Package	Quality
JANS4N49	U3, U4	70	35.35	0.196	0.005	TO-99	JANTXV
JANS4N49	U5-U7	70	35.35	0.196	0.005	TO-99	JANTXV

Resistors, Fixed, Composition

Part Number	Ref/Qty	Ohms	Rated Power	Actual Power	Quality
RCR05G101JS	R1, R7	100	0.125	0.0004	S
RCR05G101JS	R2, R8	100	0.125	0.0001	S
RCR05G101JS	R3-R6	100	0.125	0.0016	S
RCR05G101JS		100	0.125	1.0E-6	S

Part Number: 1356000

Mutliplexer / Relay Control Circuit Card Assembly

Schematic: 1355999

TABLE A2ES-EOS-16 (Cont.)

SIG_PROC.XLS
03/13/1996

Resistors, Fixed, Composition

Part Number	Ref/Qty	Ohms	Rated Power	Actual Power	Quality
RCR05G202JS	R11, R12	2000	0.125	0.018	S
RCR05G102JS	R13, R14	1000	0.125	0.016	S
RCR05G512JS	R15-R17	5100	0.125	0.028235	S
RCR05G512JS	R18, R19	5100	0.125	0.00011	S
RCR05G103JS	R20, R21	10000	0.125	0.0529	S
RCR05G103JS	R22-R24	10000	0.125	0.000064	S
RCR05G106JS	R29, R30	10000000	0.125	100.0E-9	S
RCR05G155JS	R43, R44	1500000	0.125	1.35E-05	S
RCR05G512JS	R47, R48	5100	0.125	0.00011	S
RCR20G242JS	R61	2400	0.5	0.1067	S

Resistors, Fixed, Film

Part Number	Ref/Qty	Ohms	Rated Power	Actual Power	Quality
RNC50J1002FS	R25-R28	10000	0.05	25.0E-6	S
RNC50J1003FS	R31, R32	100000	0.05	0.00036	S
RNC50J2002FS	R33, R34	20000	0.05	0.00005	S
RNC55J2803FS	R35, R36	280000	0.1	0.000112	S
RNC55J2263FS	R37, R38	226000	0.1	226.0E-9	S
RNC55J1004FS	R39, R40	1000000	0.1	16.0E-6	S
RNC55J2003FS	R41, R42	200000	0.1	0.00032	S
RNC55J1003FS	R45, R46	100000	0.1	1E-07	S
RLR05C1822FS	R49, R50	18200	0.125	0.01784	S
RLR05C3011FS	R51, R52	3010	0.125	0.01273	S
RLR05C8061FS	R53, R54	8060	0.125	0.007933	S
RLR05C1212FS	R55, R58	12100	0.125	0.01186	S
RLR05C1212FS	R56, R59	12100	0.125	0.01191	S
RLR05C1212FS	R57, R60	12100	0.125	0.01192	S
RLR05C2202FS	R62, R63	22000	0.125	0.024255	S

Resistors, Network, Fixed, Film

Part Number	Ref/Qty	Ohms	Rated Power	Actual Power	Quality
M83401K2001JA	RN1A-RN1C	2000	0.2	5.3E-6	S
M83401K1002JA	RN2A-RN2C	10000	0.2	0.00276	S
M83401K2001JA	RN3A-RN3C	2000	0.2	8.50E-03	S

TABLE A2ES-EOS-16 (Cont.)

Capacitors, Fixed, Ceramic, General Purpose			Rated	Rated	Actual	
Part Number	Ref/Qty	pF	Temp.	Voltage	Voltage	Quality
M123A02BXC104KC	C3, C4, C11, C12	100000	125	100	5	S
M123A02BXC104KC	C5, C7, C9, C10	100000	125	100	15.75	S
M123A02BXC104KC	C6, C8	100000	125	100	5	S

Capacitors, Fixed, Electrolytic, Tantalum, Solid			Rated	Rated	Actual	
Part Number	Ref/Qty	uF	Temp.	Voltage	Voltage	Quality
M39003/01-8066	C1	1.2	85	20	5	S
M39003/01-8282	C2	3.3	85	75	28	S
M39003/01-8069	C13	1	85	50	12	S
M39003/01-8069	C14	1	85	50	12	S
M39003/01-8078	C15, C16	10	85	20	4	S

		Active	Pin	Avg.	Temp		Mate / Unmate
Connector, PCB	Ref/Qty	Pins	Gauge	Current	Rise	Quality	per 1000 hours
1337748-1	P1	55	26	0.1	0.03	Mil	0.5

Interconnection Assemblies with Plated Throug						
Part Number	Ref/Qty	Layers	Quality		Wave Solder	Hand Solder
1356417-1	1	6	Mil	PTHs->	532	0

TABLE A2ES-EOS-17

SIG_PROC.XLS
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Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Failure Rate	ΠT	ΠE	ΠQ	ΠL	C1	C2
26043-16	U1, U3, U5, U7	Quad. Clocked 'D' Latch	0.00319	0.155665	0.5	0.25	1	0.0025	0.005593
M38510R05451SEX	U2, U4, U6, U8	Inverting Hex Buffer	0.00319	0.155665	0.5	0.25	1	0.0025	0.005593
M38510/05553SEX	U34-U36	Inverting Hex Buffer	0.00239	0.156141	0.5	0.25	1	0.0025	0.005593
M38510/05553SEX	U9, U15, U26	Inverting Hex Buffer	0.00239	0.155855	0.5	0.25	1	0.0025	0.005593
M38510R05554SEX	U37	Noninverting Hex Buffer	0.00070	0.155855	0.5	0.25	1	0.0025	0.004841
26122-1	U30	Digital-to-Analog Converter	0.00284	0.155674	0.5	0.25	1	0.04	0.010235
M38510/30203SCX	U10,U16,U21,U27	Quad 2-Input NAND Buffer	0.00291	0.1957	0.5	0.25	1	0.0025	0.004841
M38510R17401SCX	U31-U33	Hex Inverter	0.00211	0.155665	0.5	0.25	1	0.0025	0.004841
M38510/10101SGX	AR1, AR2	Operational Amplifier	0.00187	0.275668	0.5	0.25	1	0.01	0.00196

Optoelectronics

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠT	ΠQ	ΠE
JANS4N49	17	Optical Isolator	0.00029	0.013	0.00029	0.7	13

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠR	ΠQ	ΠE
RLR05C1101FS	R1-R14, R38	Est. Rel., 1.1K, 0.125W	6.77E-05	0.000752	1	0.03	0.2
RLR05C3321FS	R15-R28, R39	Est. Rel., 3.32K, 0.125W	6.25E-05	0.000694	1	0.03	0.2
RLR05C1002FS	R29	Est. Rel., 10K, 0.125W	4.64E-06	0.000773	1	0.03	0.2
1333073-3	R32, R35-R37	Kit, 1K to 10K, 0.125W	1.56E-05	0.000648	1	0.03	0.2
RNC05D2001FS	R33	10K, 0.1W, Est. Rel.	3.89E-06	0.000648	1	0.03	0.2
1333073-2	R34	Kit, 10K to 52.3K, 0.125W	3.89E-06	0.000648	1	0.03	0.2

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	Failure Rate	Ib	ΠCV	ΠQ	ΠE
M39014/02-1350	C5, C7, C9, C11	0.1uF, 100V, Est. Rel.	5.06E-05	0.000724	1.45473	0.03	0.4

Capacitors, Fixed, Electrolytic, Tantalum, Solid

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠCV	ΠSR	ΠQ	ΠE
M39003/01-8194	C1-C3	1uF, 50V, Est. Rel.	0.00015	0.006706	0.75858	0.33	0.03	0.4
M39003/01-8053	C4, C6	22uF, 15V, Est. Rel.	0.00022	0.007568	1.44907	0.33	0.03	0.4
M39003/01-8111	C8, C10	22uF, 35V, Est. Rel.	0.00030	0.010571	1.44907	0.33	0.03	0.4

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TABLE A2ES-EOS-17 (Cont.)

Connector, PCB	Qty/Ref	Description	Failure Rate	λb	ΠK	ΠP	ΠE		
1337748-1	P1	Receptacle, 92-Contact	0.00175	0.000285	1.5	8.21595	0.5		
Interconnection Assemblies with Plated Through Holes									
Part Number	Ref/Qty	Description	Failure Rate	λb	ΠC	ΠQ	ΠE	N1	N2
1337296-1	1	Printed Wiring Board	0.01042	1.7E-05	1.79170	1	0.5	684	0

Total Failure Rate: 0.03492

TABLE A2ES-EOS-17 (Cont.)

SIG_PROC.XLS
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Microcircuits, Gate/Logic Arrays and Microproc					Junct.		θjc		Mfr		
Part Number	Ref/Qty	Compl.	Tech.	Ea	Temp.	Watts	(°C/W)	Pins	Years	Package	Quality
26043-16	U1, U3, U5, U7	31	Digital	0.35	35.00	5.1E-6	28	16	2	Hermetic	S
M38510R05451SEX	U2, U4, U6, U8	6	Digital	0.35	35.00	5.1E-6	28	16	2	Hermetic	S
M38510/05553SEX	U34-U36	6	Digital	0.35	35.07	2.6E-3	28	16	2	Hermetic	S
M38510/05553SEX	U9, U15, U26	6	Digital	0.35	35.03	1.0E-3	28	16	2	Hermetic	S
M38510R05554SEX	U37	6	Digital	0.35	35.03	1.0E-3	28	14	2	Hermetic	S
26122-1	U30	1000	Linear	0.35	35.00	51.0E-6	28	28	2	Hermetic	S
M38510/30203SCX	U10,U16,U21,U27	4	Digital	0.5	35.64	23.0E-3	28	14	2	Hermetic	S
M38510R17401SCX	U31-U33	6	Digital	0.35	35.00	5.1E-6	28	14	2	Hermetic	S
M38510/10101SGX	AR1, AR2	23	Linear	0.65	37.44	87.0E-3	28	8	2	Can	S

Optoelectronics		θjc	Junct.	Rated	Actual		
Part Number	Ref/Qty	(°C/W)	Temp.	Power	Power	Package	Quality
JANS4N49	17	70	35.35	0.196	0.005	TO-99	JANTXV

Resistors, Fixed, Film			Rated	Actual	
Part Number	Ref/Qty	Ohms	Power	Power	Quality
RLR05C1101FS	R1-R14, R38	1100	0.125	0.0168	S
RLR05C3321FS	R15-R28, R39	3320	0.125	0.0078	S
RLR05C1002FS	R29	10000	0.125	0.02	S
1333073-3	R32, R35-R37	5500	0.125	0.0001	S
RNC05D2001FS	R33	2000	0.1	0.0001	S
1333073-2	R34	31150	0.125	0.0001	S

Capacitors, Fixed, Ceramic, General Purpose			Rated	Rated		Actual
Part Number	Ref/Qty	pF	Temp.	Voltage	Quality	Voltage
M39014/02-1350	C5, C7, C9, C11	100000	125	100	S	15.1

Capacitors, Fixed, Electrolytic, Tantalum, Solid			Rated	Rated	Actual	Ohms	
Part Number	Ref/Qty	uF	Temp.	Voltage	Voltage	/Volt	Quality
M39003/01-8194	C1-C3	0.1	85	50	15.1		S
M39003/01-8053	C4, C6	22	85	15	5.1		S
M39003/01-8111	C8, C10	22	85	35	15.1		S

TABLE A2ES-EOS-17 (Cont.)

SIG_PROC.XLS
03/13/1996

Connector, PCB	Qty/Ref	Pins	Gauge	Current	Rise	Quality	Mate / Unmate per 1000 hours
1337748-1	P1	44	26	0.1	0.03	Mil	0.5

Interconnection Assemblies with Plated Throug

Part Number	Ref/Qty	Layers	Quality		Wave Solder	Hand Solder
1337296-1	1	5	Mil	PTHs->	684	0

TABLE A2ES-EOS-18

Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Failure Rate	ΠT	ΠE	ΠQ	ΠL	C1	C2
26056-1	U23	Timer	0.00090	0.227661	0.5	0.25	1	0.01	0.0026
M38510/30203SCX	U1-U4	Quadruple NAND Buffer	0.00289	0.18823	0.5	0.25	1	0.0025	0.0048
M38510/11201SCX	U19-U22	Quad. Voltage Comparator	0.00256	0.158012	0.5	0.25	1	0.01	0.0020

Diodes, Low Frequency

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠT	ΠS	ΠC	ΠQ	ΠE
JANS1N4148-1	CR1	Switching Diode	2.65E-05	0.001	1.402698	0.054	1	0.7	0.5

Optoelectronics

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠT	ΠQ	ΠE
JANS4N49	U5-U18	Optical Isolator	0.00024	0.013	0.000292	0.7	13

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠR	ΠQ	ΠE
RLR05C1101FS	R1-R14	1100 ohms, 1%, 0.125W	6.66E-05	0.000792	1	0.03	0.2
RLR07C5110FS	R15	511 ohms, 1%, 0.25W	4.83E-06	0.000805	1	0.03	0.2
RNR81S1000FS	R16-R29	100 ohms, 1%, 1W	7.20E-05	0.000858	1	0.03	0.2
RLR07C5110FS	R30	511 ohms, 1%, 0.25W	4.83E-06	0.000805	1	0.03	0.2
RLR07C5110FS	R31	511 ohms, 1%, 0.25W	3.97E-06	0.000662	1	0.03	0.2
RNC05J1002FS	15	10K, 1%, 0.125W	6.58E-05	0.000731	1	0.03	0.2
RLR50J2491FS	15	2.49K, 1%, 0.125W	5.85E-05	0.00065	1	0.03	0.2
RLR05C3321FS	R62-R76	3.32K, 1%, 0.125W	6.23E-05	0.000692	1	0.03	0.2
1331073-15	R77	Kit, 15.4K to 36.5K, 1%, 0.05W	4.81E-06	0.000802	1	0.03	0.2

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠCV	ΠQ	ΠE
M39014/02-1350	C3, C4	Est. Rel., 0.1uF, 100V	2.45E-05	0.000703	1.454735	0.03	0.4

Capacitors, Fixed, Electrolytic, Tantalum, Solid

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠCV	ΠSR	ΠQ	ΠE
M39003/01-8053	C1, C2	Est. Rel., 22uF, 15V	0.00021	0.007402	1.449075	0.33	0.03	0.4

Part Number: 1334972

Resolver Data Isolator Circuit Card Assembly

Schematic: 1334974

SIG_PROC.XLS
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TABLE A2ES-EOS-18 (Cont.)

Inductive Devices, Transformers

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠQ	ΠE
1335677-1	T1	Pulse Type	0.00193	0.002573	1.5	0.5

Connector, PCB	Qty/Ref	Description	Failure Rate	λb	ΠK	ΠP	ΠE
1337748-1	P1	Receptacle, 92-Contact	0.00175	0.000285	1.5	8.21595	0.5

Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠC	ΠQ	ΠE	N1	N2
1337290-1	1	Printed Wiring Board	0.00627	0.000017	1.556722	1	0.5	474	0

Total Failure Rate: 0.01716

Part Number: 1334972 **Resolver Data Isolator Circuit Card Assembly** Schematic: 1334974

TABLE A2ES-EOS-18 (Cont.)

Microcircuits, Gate/Logic Arrays and Part Number	Ref/Qty	Compl.	Tech.	Ea	Junct. Temp.	Watts	θjc (°C/W)	Pins	Mfr Years	Package	Quality
26056-1	U23	23	Linear	0.65	35.01	0.0001	106	8	2	Hermetic	S
M38510/30203SCX	U1-U4	4	Digital	0.5	35.01	0.0001	50	14	2	Hermetic	S
M38510/11201SCX	U19-U22	29	Linear	0.35	35.35	0.01	35	8	2	Can	S

Diodes, Low Frequency Part Number	Ref/Qty	Contact	Type/App	Rated Voltage	Applied Voltage	Junct. Temp.	Watts	θjc (°C/W)	Case	Quality
JANS1N4148-1	CR1	Metal	Switch	75	5	35.05	0.005	10	DO-35	JANTXV

Optoelectronics Part Number	Ref/Qty	θjc (°C/W)	Junct. Temp.	Rated Power	Actual Power	Package	Quality
JANS4N49	U5-U18	70	36.75	0.196	0.025	TO-99	JANTXV

Resistors, Fixed, Film Part Number	Ref/Qty	Ohms	Rated Power	Actual Power	Quality
RLR05C1101FS	R1-R14	1100	0.125	0.02273	S
RLR07C5110FS	R15	511	0.25	0.049	S
RNR81S1000FS	R16-R29	100	1	0.16	S
RLR07C5110FS	R30	511	0.25	0.049	S
RLR07C5110FS	R31	511	0.25	0.005	S
RNC05J1002FS	15	10000	0.1	0.0016	S
RLR50J2491FS	15	2490	0.125	0.0004	S
RLR05C3321FS	R62-R76	3320	0.125	0.00753	S
1331073-15	R77	25950	0.05	0.005	S

Capacitors, Fixed, Ceramic, General Part Number	Ref/Qty	pF	Rated Temp.	Rated Voltage	Actual Voltage	Quality
M39014/02-1350	C3, C4	100000	85	100	5	S

Capacitors, Fixed, Electrolytic, Tantal Part Number	Ref/Qty	uF	Rated Temp.	Rated Voltage	Actual Voltage	Ohms/ Volt	Quality
M39003/01-8053	C1, C2	22	85	15	5		S

Part Number: 1334972

Resolver Data Isolator Circuit Card Assembly

Schematic: 1334974

TABLE A2ES-EOS-18 (Cont.)

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Inductive Devices, Transformers

Part Number	Ref/Qty	Hot Spot	ΔT	Type	Quality	Mil-T-27 and Mil-T-21308, Insul Q	
1335677-1	T1	35	5	Pulse	Mil	and Mil-T-55631, Insul O	Max Temp=85°C

Connector, PCB	Qty/Ref	Active Pins	Pin Gauge	Avg. Current	Temp. Rise	Quality	Mate / Unmate per 1000 hours
1337748-1	P1	44	26	0.1	0.03	Mil	0.5

Interconnection Assemblies with Plat

Part Number	Ref/Qty	Layers	Quality		Wave Solder	Hand Solder
1337290-1	1	4	Mil	PTHs->	474	0

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TABLE A2ES-EOS-19

Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Failure Rate	ΠT	ΠE	ΠQ	ΠL	C1	C2
26026-1	U1	Resistance-to-Digital Converter	0.00279	0.984653	0.5	0.25	1	0.01	0.002645
M38510/31004SCX	U2-U5	Quad 2-Input AND Gate	0.00295	0.211263	0.5	0.25	1	0.0025	0.004841
26056-1	U6	Timer	0.00107	0.294579	0.5	0.25	1	0.01	0.002645
M38510/13501SCX	AR1-AR4	Operational Amplifier	0.00710	0.611512	0.5	0.25	1	0.01	0.00196
M38510/13501SCX	AR5, AR6	Operational Amplifier	0.00248	0.398001	0.5	0.25	1	0.01	0.00196
M38510/13501SCX	AR7, AR8	Operational Amplifier	0.00236	0.374488	0.5	0.25	1	0.01	0.00196
M38510/10304SGX	AR9	Operational Amplifier	0.00093	0.27457	0.5	0.25	1	0.01	0.00196
M38510/10101SCX	AR10	Operational Amplifier	0.00140	0.462824	0.5	0.25	1	0.01	0.00196
M38510/10101SCX	AR11	Operational Amplifier	0.00140	0.462824	0.5	0.25	1	0.01	0.00196
M38510/10101SCX	AR12	Operational Amplifier	0.00170	0.580039	0.5	0.25	1	0.01	0.00196
26055-1	AR13	Operational Amplifier	0.00341	1.264673	0.5	0.25	1	0.01	0.00196
M38510/10101SCX	AR14	Operational Amplifier	0.00118	0.374488	0.5	0.25	1	0.01	0.00196

Diodes, Low Frequency

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠT	ΠS	ΠC	ΠQ	ΠE
JANS1N4148-1	CR3, CR4	Switching Diode	5.31E-05	0.001	1.404984	0.054	1	0.7	0.5
JANS1N6117A	CR1, CR2	Transient Suppressor, (Bidir.)	0.00262	0.001	3.749651	1	1	0.7	0.5
26041-6161A	CR5	Transient Suppressor, (Bidir.)	0.00197	0.001	5.616726	1	1	0.7	0.5
26042-751A-1	VR1	Zener Diode, Vz=5.1	0.00087	0.002	1.242706	1	1	0.7	0.5

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠR	ΠQ	ΠE
RLR05C3321FS	R2-R16	Est. Rel., 3.32K	0.00011	0.00126	1	0.03	0.2
RLR05C3321FS	R65	Est. Rel., 3.32K	7.56E-06	0.00126	1	0.03	0.2
RLR05C3321FS	R68, R69	Est. Rel., 3.32K	1.51E-05	0.00126	1	0.03	0.2
RLR20C1101FS	R61	Est. Rel., 1.10K	7.56E-06	0.00126	1	0.03	0.2
1331073-2	R21, R22, R29	Kit, 1K to 10K	2.27E-05	0.00126	1	0.03	0.2
1331073-2	R30, R59, R60	Kit, 1K to 10K	2.27E-05	0.00126	1	0.03	0.2
1331073-2	R66, R67	Kit, 1K to 10K	1.51E-05	0.00126	1	0.03	0.2
RLR07C10R0FS	R82, R83	Est. Rel., 10, .25W	1.51E-05	0.00126	1	0.03	0.2
RLR07C1002FS	R85	Est. Rel., 10K, .25W	7.56E-06	0.00126	1	0.03	0.2
1331073-22	R33	Kit	7.56E-06	0.00126	1	0.03	0.2
1331073-23	R34, R35	Kit	1.51E-05	0.00126	1	0.03	0.2
1331073-24	R40	Kit	7.56E-06	0.00126	1	0.03	0.2

Resolver Digital Converter - Oscillator
Circuit Card Assembly

Part Number: 1337739

Schematic: 1337737

TABLE A2ES-EOS-19 (Cont.)

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠR	ΠQ	ΠE
1331073-25	R41, R42	Kit	1.51E-05	0.00126	1	0.03	0.2
1331073-26	R46	Kit	7.56E-06	0.00126	1	0.03	0.2
1331073-27	R47, R48	Kit	1.51E-05	0.00126	1	0.03	0.2
1331073-28	R63	Kit	7.56E-06	0.00126	1	0.03	0.2
RNC50J1002FS	R23-R28	Est. Rel., 10K	5.03E-05	0.001398	1	0.03	0.2
RNC50J1002FS	R65	Est. Rel., 10K	8.39E-06	0.001398	1	0.03	0.2
RNC50J1002FS	R68, R69	Est. Rel., 10K	1.68E-05	0.001398	1	0.03	0.2
RNC50J1002FS	R61	Est. Rel., 10K	8.39E-06	0.001398	1	0.03	0.2
RNC50J1002FS	R55	Est. Rel., 10K, .05W	8.39E-06	0.001398	1	0.03	0.2
RNC50J1002FS	R62	Est. Rel., 10K, .05W	8.39E-06	0.001398	1	0.03	0.2
RNC50J1002FS	R81	Est. Rel., 10K, .05W	8.39E-06	0.001398	1	0.03	0.2
RNC50J1002FS	R86	Est. Rel., 10K, .05W	8.39E-06	0.001398	1	0.03	0.2
RNC50J1002FS	R87	Est. Rel., 10K, .05W	8.39E-06	0.001398	1	0.03	0.2
1331073-12	R70, R71	Kit, 90.9K to 110K	1.84E-05	0.001398	1.1	0.03	0.2
1331073-13	R84	Kit, 7K to 18.2K	8.39E-06	0.001398	1	0.03	0.2
1331073-11	R58	Kit, 6K to 34K	8.39E-06	0.001398	1	0.03	0.2
RNC50J1213FS	R79	Est. Rel., 121K	9.22E-06	0.001398	1.1	0.03	0.2
1331073-17	R19	Resistor, Kit, 38.3K to 78.7K	8.39E-06	0.001398	1	0.03	0.2
1331073-17	R20	Resistor, Kit, 38.3K to 78.7K	8.39E-06	0.001398	1	0.03	0.2
RNC50J2002FS	R51	Est. Rel., 20K	8.39E-06	0.001398	1	0.03	0.2
RNC50J2002FS	R54	Est. Rel., 20K	8.39E-06	0.001398	1	0.03	0.2
RNC50J2002FS	R80	Est. Rel., 20K	8.39E-06	0.001398	1	0.03	0.2
RNC50J5111FS	R17, R19, R56	Est. Rel., 5.11K	2.52E-05	0.001398	1	0.03	0.2
RNC50J2001FS	R57	Est. Rel., 2K	8.39E-06	0.001398	1	0.03	0.2
RNC50J2492FS	R72,R74	Est. Rel., 24.9K	1.68E-05	0.001398	1	0.03	0.2
RNC50J2492FS	R76,R78	Est. Rel., 24.9K	1.68E-05	0.001398	1	0.03	0.2
RNC50J1003FS	R73, R77	Est. Rel., 100K	1.84E-05	0.001398	1.1	0.03	0.2
RNC50J1542FS	R75	Est. Rel., 15.4K	8.39E-06	0.001398	1	0.03	0.2
RNC50J4532FS	R37, R44	Est. Rel., 45.3K	1.68E-05	0.001398	1	0.03	0.2
RNC50J3921FS	R32, R45	Est. Rel., 3.92K	1.68E-05	0.001398	1	0.03	0.2
RNC50J5491FS	R38	Est. Rel., 5.49K	8.39E-06	0.001398	1	0.03	0.2
RNC50J1001FS	R39	Est. Rel., 1.00K	8.39E-06	0.001398	1	0.03	0.2
RNC50J1004FS	R64	Est. Rel., 100M	1.34E-05	0.001398	1.6	0.03	0.2
RNC50J4122FS	R50	Est. Rel., 41.2K	8.39E-06	0.001398	1	0.03	0.2

Part Number: 1337739

Resolver Digital Converter - Oscillator
Circuit Card Assembly

Schematic: 1337737

TABLE A2ES-EOS-19 (Cont.)

SIG_PROC.XLS
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Resistors, Fixed, Wirewound, Power

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠR	ΠQ	ΠE
RWR80S5R11FS	R1	Est. Rel., 5.11, 2W	2.53E-05	0.00421	1	0.03	0.2

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠCV	ΠQ	ΠE
M39014/02-1350	C2,C4,C6,C8,C23	Est. Rel., 0.1uF, 100V	0.00050	0.005781	1.454735	0.03	0.4
M39014/02-1358	C30	Est. Rel., 0.1uF, 50V	0.00012	0.005781	1.658901	0.03	0.4
M39014/02-1593	C9, C16	Est. Rel., 0.33uF, 50V	0.00020	0.005781	1.454735	0.03	0.4
M39014/01-1575	C25	Est. Rel., 0.01uF, 100V	7.83E-05	0.005781	1.129234	0.03	0.4

Capacitors, Fixed, Electrolytic, Tantalum, Solid

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠCV	ΠQ	ΠE	ΠSR
M39003/01-8194	C1,C22	Est. Rel., 0.1uF, 50V	0.00196	0.020512	3.981072	0.03	0.4	0.33
M39003/01-8053	C3, C20	Est. Rel., 22uF, 15V	0.00374	0.020512	7.604851	0.03	0.4	0.33
M39003/01-8111	C5, C7	Est. Rel., 22uF, 35V	0.00374	0.020512	7.604851	0.03	0.4	0.33
M123A01BXB103KC	C21	0.01uF, 50V	0.00106	0.029286	3.019952	0.03	0.4	0.33
M23269/03-7067	C24	4700pF, 100V	0.00097	0.029286	2.758365	0.03	0.4	0.33
M83421/01-2047S	C26-C29, C31	3300pF, 50V	0.00465	0.029286	2.643758	0.03	0.4	0.33
M87217/01-1111A	C12, C15, C19	0.02uF, 30V	0.00346	0.029286	3.281887	0.03	0.4	0.33
M87217/01-1087A	6	0.01uF, 30V	0.00637	0.029286	3.019952	0.03	0.4	0.33

Connector, PCB	Ref/Qty	Description	Failure Rate	λb	ΠK	ΠP	ΠE
1337748-1	P1	Receptacle, 92-Contact	0.00378	0.000285	1.5	17.69336	0.5

Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠC	ΠQ	ΠE	N1	N2
1337738	B1	Printed Wiring Board	0.01085	1.7E-05	2.009781	1	0.5	635	0

Connections	Ref/Qty	Description	Failure Rate	λb	ΠQ	ΠE
Hand Solder, with Wrapping	98	Select-At-Test Resistors	0.00686	0.00014	1	0.5

Total Failure Rate: 0.08332

Resolver Digital Converter - Oscillator
Circuit Card Assembly

Part Number: 1337739

Schematic: 1337737

TABLE A2ES-EOS-19 (Cont.)

Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Compl.	Tech.	Ea	Junct. Temp.	Watts	θjc (°C/W)	Pins	Mfr Years	Package	Quality
26026-1	U1	Resistance-to-Digital Converter	100	Linear	0.65	54.60	0.28	70	8	2	Hermetic	S
M38510/31004SCX	U2-U5	Quad 2-Input AND Gate	4	Digital	0.5	36.90	0.068	28	14	2	Hermetic	S
26056-1	U6	Timer	23	Linear	0.65	38.29	0.031	106	8	2	Hermetic	S
M38510/13501SCX	AR1-AR4	Operational Amplifier	23	Linear	0.65	47.96	0.162	80	8	2	Can	S
M38510/13501SCX	AR5, AR6	Operational Amplifier	23	Linear	0.65	42.20	0.09	80	8	2	Can	S
M38510/13501SCX	AR7, AR8	Operational Amplifier	23	Linear	0.65	41.40	0.08	80	8	2	Can	S
M38510/10304SGX	AR9	Operational Amplifier	23	Linear	0.65	37.39	0.053	45	8	2	Can	S
M38510/10101SCX	AR10	Operational Amplifier	23	Linear	0.65	44.20	0.115	80	8	2	Can	S
M38510/10101SCX	AR11	Operational Amplifier	23	Linear	0.65	44.20	0.115	80	8	2	Can	S
M38510/10101SCX	AR12	Operational Amplifier	23	Linear	0.65	47.24	0.153	80	8	2	Can	S
26055-1	AR13	Operational Amplifier	23	Linear	0.65	58.20	0.29	80	8	2	Can	S
M38510/10101SCX	AR14	Operational Amplifier	23	Linear	0.65	41.40	0.08	80	8	2	Can	S

Diodes, Low Frequency

Part Number	Ref/Qty	Description	Contact	Type/ Appl	Rated Voltage	Applied Voltage	Junct. Temp.	Watts	θjc (°C/W)	Case	Quality	
JANS1N4148-1	CR3, CR4	Switching Diode	Metal	Switch	75	20	35.1	0.01	10	DO-35	JANTXV	/116
JANS1N6117A	CR1, CR2	Transient Suppressor, (Bidir.)	Metal	T. Sup.	41.6	28.5	68.516	0.4788	70	Axial-5	JANTXV	/516
26041-6161A	CR5	Transient Suppressor, (Bidir.)	Metal	T. Sup.	89.3	58.9	84.476	0.7068	70	Axial-5	JANTXV	/516
26042-751A-1	VR1	Zener Diode, Vz=5.1	Metal	V. Ref.	n/a	n/a	35.373	0.0373	10	DO-35	JANTXV	

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Ohms	Rated Power	Actual Power	Quality
RLR05C3321FS	R2-R16	Est. Rel., 3.32K	3320	0.125	0.075	S
RLR05C3321FS	R65	Est. Rel., 3.32K	3320	0.125	0.075	S
RLR05C3321FS	R68, R69	Est. Rel., 3.32K	3320	0.125	0.075	S
RLR20C1101FS	R61	Est. Rel., 1.10K	1100	0.5	0.3	S
1331073-2	R21, R22, R29	Kit, 1K to 10K	5500	0.25	0.15	S
1331073-2	R30, R59, R60	Kit, 1K to 10K	5500	2	1.2	S
1331073-2	R66, R67	Kit, 1K to 10K	5500	2	1.2	S
RLR07C10R0FS	R82, R83	Est. Rel., 10, .25W	10	0.25	0.15	S
RLR07C1002FS	R85	Est. Rel., 10K, .25W	10000	0.25	0.15	S
1331073-22	R33	Kit		0.125	0.075	S
1331073-23	R34, R35	Kit		0.125	0.075	S
1331073-24	R40	Kit		0.125	0.075	S

Resolver Digital Converter - Oscillator
Circuit Card Assembly

Part Number: 1337739

Schematic: 1337737

TABLE A2ES-EOS-19 (Cont.)

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Ohms	Rated Power	Actual Power	Quality
1331073-25	R41, R42	Kit		0.125	0.075	S
1331073-26	R46	Kit		0.125	0.075	S
1331073-27	R47, R48	Kit		0.125	0.075	S
1331073-28	R63	Kit		0.125	0.075	S
RNC50J1002FS	R23-R28	Est. Rel., 10K	10000	0.05	0.03	S
RNC50J1002FS	R65	Est. Rel., 10K	10000	0.05	0.03	S
RNC50J1002FS	R68, R69	Est. Rel., 10K	10000	0.05	0.03	S
RNC50J1002FS	R61	Est. Rel., 10K	10000	0.05	0.03	S
RNC50J1002FS	R55	Est. Rel., 10K, .05W	10000	0.05	0.03	S
RNC50J1002FS	R62	Est. Rel., 10K, .05W	10000	0.05	0.03	S
RNC50J1002FS	R81	Est. Rel., 10K, .05W	10000	0.05	0.03	S
RNC50J1002FS	R86	Est. Rel., 10K, .05W	10000	0.05	0.03	S
RNC50J1002FS	R87	Est. Rel., 10K, .05W	10000	0.05	0.03	S
1331073-12	R70, R71	Kit, 90.9K to 110K	100450	0.125	0.075	S
1331073-13	R84	Kit, 7K to 18.2K	12600	0.125	0.075	S
1331073-11	R58	Kit, 6K to 34K	20000	0.125	0.075	S
RNC50J1213FS	R79	Est. Rel., 121K	121000	0.05	0.03	S
1331073-17	R19	Resistor, Kit, 38.3K to 78.7K	58500	0.1	0.06	S
1331073-17	R20	Resistor, Kit, 38.3K to 78.7K	58500	0.1	0.06	S
RNC50J2002FS	R51	Est. Rel., 20K	20000	0.05	0.03	S
RNC50J2002FS	R54	Est. Rel., 20K	20000	0.05	0.03	S
RNC50J2002FS	R80	Est. Rel., 20K	20000	0.05	0.03	S
RNC50J5111FS	R17, R19, R56	Est. Rel., 5.11K	5110	0.1	0.06	S
RNC50J2001FS	R57	Est. Rel., 2K	2000	0.05	0.03	S
RNC50J2492FS	R72,R74	Est. Rel., 24.9K	24900	0.05	0.03	S
RNC50J2492FS	R76,R78	Est. Rel., 24.9K	24900	0.05	0.03	S
RNC50J1003FS	R73, R77	Est. Rel., 100K	100000	0.05	0.03	S
RNC50J1542FS	R75	Est. Rel., 15.4K	15400	0.05	0.03	S
RNC50J4532FS	R37, R44	Est. Rel., 45.3K	45300	0.05	0.03	S
RNC50J3921FS	R32, R45	Est. Rel., 3.92K	3920	0.05	0.03	S
RNC50J5491FS	R38	Est. Rel., 5.49K	5490	0.05	0.03	S
RNC50J1001FS	R39	Est. Rel., 1.00K	1000	0.05	0.03	S
RNC50J1004FS	R64	Est. Rel., 100M	1.0E+6	0.05	0.03	S
RNC50J4122FS	R50	Est. Rel., 41.2K	41200	0.05	0.03	S

Part Number: 1337739

Resolver Digital Converter - Oscillator
Circuit Card Assembly

Schematic: 1337737

TABLE A2ES-EOS-19 (Cont.)

SIG_PROC.XLS
03/13/1996

Resistors, Fixed, Wirewound, Power

Part Number	Ref/Qty	Description	Ohms	Rated Power	Actual Power	Quality
RWR80S5R11FS	R1	Est. Rel., 5.11, 2W	5.11	2	0.0104	S

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	pF	Rated Temp.	Rated Voltage	Actual Voltage	Quality
M39014/02-1350	C2,C4,C6,C8,C23	Est. Rel., 0.1uF, 100V	100000	125	100	60	S
M39014/02-1358	C30	Est. Rel., 0.1uF, 50V	330000	125	50	30	S
M39014/02-1593	C9, C16	Est. Rel., 0.33uF, 50V	100000	125	50	30	S
M39014/01-1575	C25	Est. Rel., 0.01uF, 100V	10000	125	100	60	S

Capacitors, Fixed, Electrolytic, Tantalum, Solid

Part Number	Ref/Qty	Description	pF	Series Ohms	Rated Temp.	Rated Voltage	Actual Voltage	Quality
M39003/01-8194	C1,C22	Est. Rel., 0.1uF, 50V	100000		125	50	30	S
M39003/01-8053	C3, C20	Est. Rel., 22uF, 15V	22.0E+6		125	15	9	S
M39003/01-8111	C5, C7	Est. Rel., 22uF, 35V	22.0E+6		125	35	21	S
M123A01BXB103KC	C21	0.01uF, 50V	10000		85	50	30	S
M23269/03-7067	C24	4700pF, 100V	4700		85	100	60	S
M83421/01-2047S	C26-C29, C31	3300pF, 50V	3300		85	50	30	S
M87217/01-1111A	C12, C15, C19	0.02uF, 30V	20000		85	30	18	S
M87217/01-1087A	6	0.01uF, 30V	10000		85	30	18	S

Connector, PCB	Ref/Qty	Description	Active Pins	Pin Gauge	Avg. Current	Temp. Rise	Quality	Mate / Unmate per 1000 hours
1337748-1	P1	Receptacle, 92-Contact	80	26	0.1	0.03	Mil	0.5

Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty	Description	Layers	Quality		Wave Solder	Hand Solder
1337738	B1	Printed Wiring Board	6	Mil	PTHs->	635	0

Part Number: 1337739

Resolver Digital Converter - Oscillator
Circuit Card Assembly

Schematic: 1337737

TABLE A2ES-EOS-20

SIG_PROC.XLS
03/13/1996

Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Failure Rate	ΠT	ΠE	ΠQ	ΠL	C1	C2
AS83332/30203SCX	U1	Quadruple NAND Buffer	0.00073	0.1988	0.5	0.25	1	0.0025	0.0048
AS8332/30502SCX	U3	Quadruple 2-Input XOR Gate	0.00073	0.1988	0.5	0.25	1	0.0025	0.0048
AS8332/30701SEX	U4	3-to-8 Line Decoder	0.00082	0.1988	0.5	0.25	1	0.0025	0.0056
AS8332/31004SCX	U5,U6	Quadruple 2-Input AND Gate	0.00146	0.1988	0.5	0.25	1	0.0025	0.0048
AS8332/30001SCX	U7	Quadruple 2-Input NAND Gate	0.00073	0.1988	0.5	0.25	1	0.0025	0.0048
AS8332/12302SEX	U8,U9	Quadruple CMOS Switch	0.00269	0.2577	0.5	0.25	1	0.01	0.0056
AS8332/10101SGX	AR1	Operational Amplifier	0.00087	0.2502	0.5	0.25	1	0.01	0.002
AS8332/10101SGX	AR2-AR4	Operational Amplifier	0.00261	0.2502	0.5	0.25	1	0.01	0.002

Diodes, Low Frequency

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠT	ΠS	ΠC	ΠQ	ΠE
AS8301-1N41481S	CR1,CR5,CR9	Switching Diode	1.59E-05	0.001	1.405	0.054	1	0.7	0.5
AS8301-1N41481S	CR2,CR6,CR10	Switching Diode	1.59E-05	0.001	1.4004	0.054	1	0.7	0.5
AS8301-1N41481S	CR3,CR7,CR11	Switching Diode	1.59E-05	0.001	1.4013	0.054	1	0.7	0.5
AS8301-1N41481S	CR21,CR26,CR16	Switching Diode	1.59E-05	0.001	1.4027	0.054	1	0.7	0.5
AS8301-1N41481S	CR14,CR19,CR24	Switching Diode	1.59E-05	0.001	1.405	0.054	1	0.7	0.5
AS8301-1N41481S	CR15,CR20,CR25	Switching Diode	1.59E-05	0.001	1.4009	0.054	1	0.7	0.5
AS8301-1N5417-S	CR4,CR8,CR12	Fast Switching Rectifier	2.80E-06	0.001	1.4005	0.0953	1	0.7	0.5
AS8301-1N5417-S	CR17,CR22,CR27	Fast Switching Rectifier	2.80E-06	0.001	1.4005	0.0953	1	0.7	0.5
AS8301-751A1S	VR1,VR2	Zener Diode, Vz = 5.1	0.00596	0.002	1.2427	1	1	2.4	0.5
AS8301-1N5651AS	CR13	Transient Absortion Zener	0.00245	0.0013	1.5726	1	1	2.4	0.5

Transistors, Low Frequency, Bipolar

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠT	ΠA	ΠR	ΠS	ΠQ	ΠE
AS8302-2N2222A	Q1,Q4,Q7	NPN General Purpose	1.74E-05	0.0007	1.2614	0.7	0.7125	0.1699	0.7	1
AS8302-2N2907A	Q2,Q5,Q8	PNP General Purpose	1.62E-05	0.0007	1.2696	0.7	0.656	0.1699	0.7	1
AS8302-2N6193S	Q3,Q6,Q9	Power PNP (2N6193)	0.00016	0.0007	1.2629	0.7	1	0.3205	2.4	1
AS8302-2N2222A	Q10,Q12,Q14	NPN General Purpose	1.75E-05	0.0007	1.2689	0.7	0.7125	0.1699	0.7	1
AS8302-2N6193S	Q11,Q13,Q15	Power PNP (2N6193)	0.00016	0.0007	1.2629	0.7	1	0.3205	2.4	1

TABLE A2ES-EOS-20 (Cont.)

SIG_PROC.XLS
03/13/1996

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠR	ΠQ	ΠE
RLR05C3321FS	R1,R7,R13	Est. Rel., 3.32K, 0.125W	1.20E-05	0.0007	1	0.03	0.2
RLR05C3321FS	R19-R21	Est. Rel, 3.32K, 0.125W	1.18E-05	0.0007	1	0.03	0.2
RLR05C3321FS	6	Est. Rel., 3.32K, 0.125W	2.40E-05	0.0007	1	0.03	0.2
RLR0--4751FS	R3,R9,R15	Est. Rel., 4.75K, 0.25W	1.69E-05	0.0009	1	0.03	0.2
RLR05C2002FS	R30,R38,R47	Est.. Rel., 20K, 0.125W	1.17E-05	0.0006	1	0.03	0.2
RLR05C1001FS	R27,R35,R44	Est.. Rel., 20K, 0.125W	1.17E-05	0.0006	1	0.03	0.2
RLR05C1001FS	R29,R37,R46	Est.. Rel., 20K, 0.125W	1.17E-05	0.0006	1	0.03	0.2
RLR05C1002FS	R26,R34,R43	Est.. Rel., 20K, 0.125W	1.17E-05	0.0006	1	0.03	0.2
RLR07C51R1FS	R28,R36,R45	Est. Rel., 51.1 ohms, 0.25W	2.41E-05	0.0013	1	0.03	0.2
RLR20C1101FS	R39,R48	Est. Rel., 1.1K, 0.5W	4.43E-05	0.0037	1	0.03	0.2
1331072-2	6	Resistor Kit	2.35E-05	0.0007	1	0.03	0.2
1331073-99	6	Resistor Kit	4.06E-05	0.0011	1	0.03	0.2

Resistors, Fixed, Wirewound, Power

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠR	ΠQ	ΠE
1331074-1 *(A1)*	R6, R12, R18	Kit, Est. Rel., 10 to 44.2, 1W	0.00012	0.0046	1	0.03	0.3
1331073-14 *(A2)*	R6, R12, R18	Kit, Est. Rel., 1 to 2 ohms, 1	0.00022	0.0082	1	0.03	0.3
RWR80S1R50FS	R5, R11, R17	Est. Rel., 1.50 ohms, 2W	0.00016	0.0058	1	0.03	0.3
RWR80S1R50FS	R49, R50	Est. Rel., 1.50 ohms, 2W	0.00011	0.0058	1	0.03	0.3

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠCV	ΠQ	ΠE
M39014/02-1350	C2	Est. Rel., 0.1uF, 100V	1.12E-05	0.0006	1.4547	0.03	0.4
M39014/02-1350	C4,C10	Est. Rel., 0.1uF, 100V	2.24E-05	0.0006	1.4547	0.03	0.4
M39014/02-1350	C6	Est. Rel., 0.1uF, 100V	1.26E-05	0.0007	1.4547	0.03	0.4

Capacitors, Fixed, Electrolytic, Tantalum, Solid

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠCV	ΠSR	ΠQ	ΠE
M39003/01-8053	C1	Est. Rel., 22uF, 15V	4.34E-05	0.0076	1.4491	0.33	0.03	0.4
M39003/01-8053	C7,C8	Est. Rel., 22uF, 15V	0.00037	0.0079	1.4491	1.33	0.03	0.4
M39003/01-8111	C3,C9	Est. Rel., 22uF, 35V	0.00086	0.0106	1.4491	2.33	0.03	0.4
M39003/01-8297	C6	Est. Rel., 10uF, 75V	0.00049	0.0094	1.3183	3.33	0.03	0.4

Connector, PCB	Ref/Qty	Description	Failure Rate	λb	ΠK	ΠP	ΠE
1337748-1	P1	Receptacle, 92-Contact	0.00469	0.0003	1.5	21.941	0.5

Part Number: 1331694 **3-Hall Sensor Motor Drive Circuit Card Assembly** Schematic: 1331695

TABLE A2ES-EOS-20 (Cont.)

SIG_PROC.XLS
03/13/1996

Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty	Description	Failure Rate	λb	ΠC	ΠQ	ΠE	N1	N2
1337289	1	Printed Wiring Board	0.00636	1.7E-05	1.5567	1	0.5	481	0
Connections	**Ref/Qty**	**Description**	**Failure Rate**	**λb**	**ΠQ**	**ΠE**			
Hand Solder, w/Wrapping	48	Select-At-Test Resistors	0.00336	0.0001	1	0.5			

-1 Failure Rate: 0.03637
-2 Failure Rate: 0.03647

TABLE A2ES-EOS-20 (Cont.)

SIG_PROC.XLS
03/13/1996

Microcircuits, Gate/Logic Arrays and Microprocessors

Part Number	Ref/Qty	Description	Compl.	Tech.	Ea	Junct. Temp.	Watts	θjc (°C/W)	Pins	Mfr Years	Package	Quality
AS83332/30203SCX	U1	Quadruple NAND Buffer	4	Digital	0.5	35.90	0.018	50	14	2	DIP	S
AS8332/30502SCX	U3	Quadruple 2-Input XOR Gate	4	Digital	0.5	35.90	0.018	50	14	2	DIP	S
AS8332/30701SEX	U4	3-to-8 Line Decoder	16	Digital	0.5	35.90	0.018	50	16	2	DIP	S
AS8332/31004SCX	U5,U6	Quadruple 2-Input AND Gate	4	Digital	0.5	35.90	0.018	50	14	2	DIP	S
AS8332/30001SCX	U7	Quadruple 2-Input NAND Gate	4	Digital	0.5	35.90	0.018	50	14	2	DIP	S
AS8332/12302SEX	U8,U9	Quadruple CMOS Switch	41	Linear	0.65	36.58	0.045	35	16	2	DIP	S
AS8332/10101SGX	AR1	Operational Amplifier	23	Linear	0.65	36.20	0.015	80	8	2	Can	S
AS8332/10101SGX	AR2-AR4	Operational Amplifier	23	Linear	0.65	36.20	0.015	80	8	2	Can	S

Diodes, Low Frequency

Part Number	Ref/Qty	Description	Contact	Type/App	Rated Voltage	Applied Voltage	Junct. Temp.	Actual Watts	θjc (°C/W)	Case	Quality
AS8301-1N41481S	CR1,CR5,CR9	Switching Diode	Metal	Switch	75	20	35.10	0.01	10	DO-35	JANTXV
AS8301-1N41481S	CR2,CR6,CR10	Switching Diode	Metal	Switch	75	20	35.00	1.0E-6	10	DO-35	JANTXV
AS8301-1N41481S	CR3,CR7,CR11	Switching Diode	Metal	Switch	75	20	35.02	0.002	10	DO-35	JANTXV
AS8301-1N41481S	CR21,CR26,CR16	Switching Diode	Metal	Switch	75	20	35.05	0.005	10	DO-35	JANTXV
AS8301-1N41481S	CR14,CR19,CR24	Switching Diode	Metal	Switch	75	20	35.10	0.01	10	DO-35	JANTXV
AS8301-1N41481S	CR15,CR20,CR25	Switching Diode	Metal	Switch	75	20	35.01	0.001	10	DO-35	JANTXV
AS8301-1N5417-S	CR4,CR8,CR12	Fast Switching Rectifier	Metal	Switch	100	38	35.00	0.0001	10	DO-41	JANTXV
AS8301-1N5417-S	CR17,CR22,CR27	Fast Switching Rectifier	Metal	Switch	100	38	35.00	0.0001	10	DO-41	JANTXV
AS8301-751A1S	VR1,VR2	Zener Diode, Vz = 5.1	Metal	V. Ref.	n/a	n/a	35.37	0.0373	10	DO-35	JAN
AS8301-1N5651AS	CR13	Transient Absortion Zener	Metal	T. Sup.	n/a	n/a	38.60	0.36	10	DO-13	JAN

Transistors, Low Frequency, Bipolar

Part Number	Ref/Qty	Description	Case	θjc (°C/W)	Junct. Temp.	Rated Power	Actual Power	Rated Vceo	VCE Applied	Appl. (Lin/Sw)	Quality
AS8302-2N2222A	Q1,Q4,Q7	NPN General Purpose	TO-18	70	35.08	0.4	0.0012	35	15	Sw	JANTXV
AS8302-2N2907A	Q2,Q5,Q8	PNP General Purpose	TO-18	70	35.38	0.32	0.0054	35	15	Sw	JANTXV
AS8302-2N6193S	Q3,Q6,Q9	Power PNP (2N6193)	TO-5	70	35.14	1	0.002	60	38	Sw	JAN
AS8302-2N2222A	Q10,Q12,Q14	NPN General Purpose	TO-18	70	35.35	0.4	0.005	35	15	Sw	JANTXV
AS8302-2N6193S	Q11,Q13,Q15	Power PNP (2N6193)	TO-5	70	35.14	1	0.002	60	38	Sw	JAN

TABLE A2ES-EOS-20 (Cont.)

SIG_PROC.XLS
03/13/1996

Resistors, Fixed, Film

Part Number	Ref/Qty	Description	Ohms	Rated Power	Actual Power	Quality
RLR05C3321FS	R1,R7,R13	Est. Rel., 3.32K, 0.125W	3320	0.125	0.0035	S
RLR05C3321FS	R19-R21	Est. Rel, 3.32K, 0.125W	3320	0.125	0.00185	S
RLR05C3321FS	6	Est. Rel., 3.32K, 0.125W	3320	0.125	0.0035	S
RLR0--4751FS	R3,R9,R15	Est. Rel., 4.75K, 0.25W	4750	0.25	0.0836	S
RLR05C2002FS	R30,R38,R47	Est.. Rel., 20K, 0.125W	20000	0.125	0.00013	S
RLR05C1001FS	R27,R35,R44	Est.. Rel., 20K, 0.125W	1000	0.125	0.00013	S
RLR05C1001FS	R29,R37,R46	Est.. Rel., 20K, 0.125W	1000	0.125	0.00007	S
RLR05C1002FS	R26,R34,R43	Est.. Rel., 20K, 0.125W	10000	0.125	1E-06	S
RLR07C51R1FS	R28,R36,R45	Est. Rel., 51.1 ohms, 0.25W	51.1	0.125	0.082	S
RLR20C1101FS	R39,R48	Est. Rel., 1.1K, 0.5W	1100	0.125	0.196	S
1331072-2	6	Resistor Kit		0.125	0.001	S
1331073-99	6	Resistor Kit		0.125	0.0625	S

Resistors, Fixed, Wirewound, Power

Part Number	Ref/Qty	Description	Ohms	Rated Power	Actual Power	Quality
1331074-1 *(A1)*	R6, R12, R18	Kit, Est. Rel., 10 to 44.2, 1W	27.1	1	0.041	S
1331073-14 *(A2)*	R6, R12, R18	Kit, Est. Rel., 1 to 2 ohms, 1	1.5	1	0.306	S
RWR80S1R50FS	R5, R11, R17	Est. Rel., 1.50 ohms, 2W	1.5	2	0.306	S
RWR80S1R50FS	R49, R50	Est. Rel., 1.50 ohms, 2W	1.5	2	0.306	S

Capacitors, Fixed, Ceramic, General Purpose

Part Number	Ref/Qty	Description	pF	Rated Temp.	Rated Voltage	Actual Voltage	Quality
M39014/02-1350	C2	Est. Rel., 0.1uF, 100V	100000	125	200	5.1	S
M39014/02-1350	C4,C10	Est. Rel., 0.1uF, 100V	100000	125	200	5.1	S
M39014/02-1350	C6	Est. Rel., 0.1uF, 100V	100000	125	200	30	S

Capacitors, Fixed, Electrolytic, Tantalum, Solid

Part Number	Ref/Qty	Description	uF	Rated Temp.	Rated Voltage	Actual Voltage	Quality
M39003/01-8053	C1	Est. Rel., 22uF, 15V	22	85	15	5.1	S
M39003/01-8053	C7,C8	Est. Rel., 22uF, 15V	22	85	15	5.3	S
M39003/01-8111	C3,C9	Est. Rel., 22uF, 35V	22	85	35	15.1	S
M39003/01-8297	C6	Est. Rel., 10uF, 75V	10	85	75	30	S

Connector, PCB	Ref/Qty	Description	Active Pins	Pin Gauge	Average Current	Temp Rise	Quality	Mate / Unmate per 1000 hours
1337748-1	P1	Receptacle, 92-Contact	92	26	0.1	0.03	Mil	0.5

SIG_PROC.XLS
03/13/1996

TABLE A2ES-EOS-20 (Cont.)

Interconnection Assemblies with Plated Through Holes

Part Number	Ref/Qty	Description	*Layers*	*Quality*		*Wave Solder*	*Hand Solder*
1337289	1	Printed Wiring Board	*4*	*Mil*	*PTHs->*	*481*	*0*

Part Number: 1331694

3-Hall Sensor Motor Drive Circuit Card Assembly

Schematic: 1331695

TABLE A2ES-EOS-21

Part Number 1356431-1 and -2

Item No.	Qty Reqd	Part Number	Nomenclature	Designation	Active Pins
1	1	AS8096-25PLR0	Connector, 25 Pin, LF Filter	J1	25
2	1	311P409-4S-B-12	Connector, Sub-D	P701	28
3	1	AS8096-9SLR0	Connector, 9 Pin, LF Filter	P901	5

Designation	λp	λb	πK	πP	πE	πQ	i_{AVG}	ΔT	Pin AWG
J1 Connector	0.00068	0.00057	1.0	4.78	0.50		0.1	0.01397	22
Connections	0.0325	0.0026			0.50	1.0			*Hand solder w/o Wrapping*
Shields	0.00007	0.00014			0.50	1.0			*Hand solder w/ Wrapping*
P701 Connector	0.00075	0.00057	1.0	5.26	0.50		0.1	0.01397	22
Connections	0.00364	0.00026			0.50	1.0			*Hand solder w/o Wrapping*
P901 Connector	0.00027	0.00057	1.0	1.87	0.50		0.1	0.01397	22
Connections	0.0065	0.0026			0.50	1.0			*Hand solder w/o Wrapping*
	0.04440								

TABLE A2ES-EOS-22

Part Number 1356817-1

Item No.	Qty Reqd	Part Number	Nomenclature	Designation	Active Pins
1	1	311P409-1P-B-12	Connector, Sub-D	P901	5
2	1	311P409-1S-B-12	Connector, Sub-D	P801	5

Designation	λp	λb	πK	πP	πE	πQ	i_{AVG}	ΔT	AWG
P901 Connector	0.00027	0.00057	1.0	1.87	0.50		0.1	0.01397	22
Connections	0.00065	0.00026			0.50	1.0		*Crimp*	
P801 Connector	0.00027	0.00057	1.0	1.87	0.50		0.1	0.01397	22
Connections	0.00065	0.00026			0.50	1.0		*Crimp*	
hield Connections	0.00021	0.00007			0.50			*Crimp*	
	0.00204								

TABLE A2ES-EOS-23

Part Number 1356818-1

Item No.	Qty Reqd	Part Number	Nomenclature	Designation	Active Pins
1	1	311P409-2P-B-12	Connector, Sub-D	P902	23
2	1	311P409-2S-B-12	Connector, Sub-D	P802	22

Designation	λp	λb	πK	πP	πE	πQ	i_{AVG}	ΔT	Pin AWG
P902 Connector	0.00063	0.00057	1.0	4.46	0.50		0.1	0.01397	22
Connections	0.00299	0.00026			0.50	1.0			*Crimp*
P802 Connector	0.00061	0.00057	1.0	4.31	0.50		0.1	0.01397	22
Connections	0.00286	0.00026			0.50	1.0			*Crimp*
	0.00710								

TABLE A2ES-EOS-24

Part Number 1356819-1

Item No.	Qty Reqd	Part Number	Nomenclature	Designation	Active Pins
1	1	311P409-2S-B-12	Connector, Sub-D	P903	12
2	1	311P409-2P-B-12	Connector, Sub-D	P803	14

Designation	λp	λb	πK	πP	πE	πQ	i_{AVG}	ΔT	Pin AWG
P902 Connector	0.00041	0.00057	1.0	2.86	0.50		0.1	0.01397	22
Connections	0.00156	0.00026			0.50	1.0			*Hand Solder, w/Wrapping*
P802 Connector	0.00045	0.00057	1.0	3.14	0.50		0.1	0.01397	22
Connections	0.00182	0.00026			0.50	1.0			*Hand Solder, w/Wrapping*
	0.00241								

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DOCUMENT APPROVAL SHEET

TITLE	DOCUMENT NUMBER
Meteorological Satellite (METSAT) and Earth Observing System (EOS) Advanced Microwave Sounding Unit A (AMSU-A) Reliability Prediction Report	Report 9831C March 1996

INPUT FROM:	DATE	CDRL:	SPECIFICATION ENGINEER:	DATE
		110	R. Regehr	14 Mar 96

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APPROVAL SIGNATURES	DEPT. NO.	DATE
Technical Director/DPM (R. Hauerwaas) RW Hauerwaas	4001	3/15/96
Performance Assurance (R. Taylor) RM Taylor	5331	3-15-96
Configuration Management (J. Cavanaugh) J Cavanaugh	8611	3-15-96

By my signature, I certify the above document has been reviewed by me and concurs with the technical requirements related to my area of responsibility.

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